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PSYCHO-PHYSIO DYNAMICS IN VIOLIN-PIANO DUO: A PIANIST'S PERSPECTIVE

Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Música, realizada sob a orientação científica da Professora Doutora Prof. Nancy Lee Harper, Professora Associada com Agregação e coorientação da Professora Doutora Filipa Lã, Professora Auxiliar Convidada do Departamento de Comunicação e Arte da Universidade de Aveiro.

Dedicatória

A tutti i presenti e assenti della mia vita che custodisco nel mio cuore… soprattutto a papá

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Publicações resultantes do trabalho apresentado nesta tese

1. Facchini F., Harper N. Lee; Lã F. M.B., Ricca C. (2013). Beating Together*:* Case Study of Heart Rate in Partners Change in Violin & Piano Duo. *Proceedings of the International Symposium on Performance Science 2013*, edited by Aaron Williamon and Werner Goebl, published by the European Association of Conservatoires (AEC), Brussels, Belgium. ISBN 9782960137804, 337-342.

Papers presented in International Conferences:

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Palavras-Chave Duo Violino e Piano, Ansiedade e Stress in Performance, Cortisolo, VitalJacket®, Testes Psicológicos, Ansiedade na Performance Musical

Resumo

O presente estudo de caso debruça-se sobre as respostas psicológicas (ansiedade) e fisiológicas (stress) em músicos, comparando um duo de violino e piano consolidado e um recém-formado em momentos de performance. O elemento comum entre estes duos foi a pianista. Utilizando os testes psicológicos (STAI Y1 e Y2, K-MPAI, MMPI-2, ICAC), o protocolo Hight Sensivity Salivary Cortisol Enzyme Immunoassay kit da Salimetrics® para medir o cortisol (hormona do stress) e o dispositivo não invasivo VitalJacket® (para medir o batimento cardíaco) desenvolvido na Universidade de Aveiro, Portugal, os participantes foram monitorados em várias condições de desempenho. Outro conjunto de dados quantitativos e qualitativos foram coletados, incluindo o diário pessoal da pianista (analisado pelo psiquiatra), entrevistas semi-estruturadas com membros de duos de música de câmara de longo prazo e avaliação da percepção (teste auditivo) das performances realizada com ouvintes especialistas. As variáveis incluíram duas salas de concertos (sala duma universidade europeia e outra duma escola de ensino secundário), bem como repertório bem conhecido, repertório recentemente conhecido e peças nunca ensaiadas antes dos recitais. Estas últimas peças foram fornecidas aproximadamente uma semana antes de cada concerto. O conjunto dos dados psicológicos e fisiológicos foram coletados para um total de oito recitais - duas séries de quatro recitais cada. Os resultados, inesperados, mostram que os níveis de ansiedade de estado e de stress da pianista, que não apresenta um perfil de pessoa ansiosa nem em termos sociais nem em termos musicais, são sempre mais elevados quando toca com o parceiro conhecido. Possíveis explicações podem ser às expectativas mais elevadas em relação a qualidade da performance e as implicações dos neurónios a espelho (uma vez que as reações são muito diferentes conforme ao parceiro). Ou seja, um “espaço conhecido” (o duo consolidado) pode ficar “preso” dentro espaços preestabelecidos, sobretudo a nível psicológico, em quanto o “desconhecido” (o duo ocasional) parece ser menos envolvido e portanto mais tranquilizante e emocionante em termos positivos. Para além disso, a preferência de qualificados músicos ouvintes, foi para o duo consolidado.

Keywords Violin and Piano Duo, Anxiety and Stress in Performance, Cortisol, VitalJacket®, Psychological Tests, Music Performance Anxiety

Abstract

The case study looked at psychological and physiological responses to stress in musicians, comparing a newly formed and a consolidated violin-piano duo. The common element between these duos was the pianist. Using the psychological tests (STAI Y1 and Y2, K-MPAI, MMPI-2, ICAC), the immunoassay saliva test to measure cortisol (stress hormone) and non- invasive device VitalJacket® developed at the University of Aveiro, Portugal, participants were monitored under various performance conditions. Others quantitative and qualitative dataset were collected including a pianist's personal diary (analyzed by psychiatrist), semi-structured interviews with members of long-terms chamber music duo and perceptual evaluations (listening test) of the performances by expert listeners. The variables included two performance venues (European university and secondary school), as well as well-known repertoire, recently known repertoire and newly known repertoire. The latter was given approximately one week before each recital. The psychological and physiological dataset were collected for a total of eight recitals – two series of four recitals each. The unexpected results show that state anxiety levels and stress of the pianist, who does not present an anxious profile, either in social or in musical terms, are always higher when playing with a well-known partner. Possible explanations may be due to the highest expectations for quality of performance and implications of mirror neurons (since the reactions are very different according to the partner). In other words, the "known" (i.e., the consolidated duo) can become "trapped" within a predetermined space, especially at the psychological level, while the "unknown" (the occasional duo) seems to be less involved and therefore more reassuring and exciting in positive terms. In addition, the preference of the expert audience is for the consolidated duo.

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LIST OF ABBREVIATIONS

"A" = cortisol measurement just before start the performance

"B" = cortisol measurement just after the end of performance

"C" = cortisol measurement 30 minutes after the end of the performance

A = heart rate measurement from fifteen minutes before start the performance

B = heart rate measurement during performance

C = heart rate measurement from the end just to fifteen minutes after the end of performance

AT = Ana Torres (psychologist)

bpm = beat por minute

CDuo = Consolidated Duo

CF = cardiac frequency

CL = Carina Leite (technical analyst)

FR = Fausto Russo (psychiatrist)

HR = Heart Rate

ICAC = Inventário Clínico do Auto-Conceito (Clinical Inventory of Self-Concept)

JS = João Sá (cardiologist)

K-MPAI = Kenny Music Performance Anxiety Inventory

MMPI-2 = Minnesota Multiphasic Personality Inventory

MPA = Music Performance Anxiety

Ms = Measure

NRp = Never Rehearsed piece

ODuo = Occasional Duo

P = Pianist

PV_1 = Pianist performing with V_1

PV_2 = Pianist performing with V_2

RKnR = Recently known Repertoire

STAI Y1 = State Anxiety Inventory

STAI Y2 = State Trait Inventory

V_1 = Violinist 1 (consolidated partner)

V_2 = Violinist 2 (occasional partner)

VA = Venue A (university concert hall)

VB = Venue B (secondary school auditorium)

VJ = VitalJacket®

WKnR = Well-known Repertoire

PART I : CONTEXTUALIZATION

CHAPTER 1: INTRODUCTION

1.INTRODUCTION

1.1. Research focus

Music performance is one of the most complex activities performed by humans, for it requires concomitant activation of different brain areas (Zatorre *et al.*, 2007). Moreover, music making has been recognised as an exclusive human activity, considering that it requires synchronisation between individuals participating in this activity, a skill that other species do not possess (Fitch, 2005). Despite the importance of rhythmical synchronisation in music performance, the number of studies dedicated to solo performance is much higher than those focussed on chamber music (Gabrielsson, 2003). Unanswered questions that have already been addressed in solo performance still exist in group music making. For example, anxiety in music performance has been extensively studied, including symptoms, their causes and impacts on overall performance quality, and even coping strategies for musicians. However, this is not the case of an instrumental duo. It is common that the pianist performs with several partners during the years, but no investigation has been concerned with the impact of that change in the psychological and physiological dynamics of the pianist and if this change affects the quality of duo performance.

Ensemble performance results from the social interaction amongst musicians (Goodman, 2002). For a pianist in an instrumental duo, what would be the consequences of changing partners in performance in terms of the musical, psychological and biological interactions that are established through music performance? How does this change affect anxiety levels of the pianist and the quality of music making? Are musical aspects in *ensemble* music performance such as synchronisation and dialogue (Goodman, 2002) affected by changing partners? Could levels of psychological anxiety and physiological stress in performance be of such a nature that would make the audience prefer one duo instead of the other?

A violin-piano duo was chosen because the author is a pianist of a violin-piano duo for many years and because she has been intrigued about what factors could improve or affect performance anxiety and stress when she playing in a consolidated or occasional duo.

Besides being such an important activity to the human being, there are still many aspects of musical performance that are not visible to the eye of the most competent musician (Rink, 2008).

It is the main goal of this investigation to disentangle the underlying psychological and physiological reactions of the pianist in duo performance, under different performance conditions. To be more precise, the intention is to understand the self, in this particular case, the pianist within a violin-piano duo, when changing partners in live performance. For the purposes of this study, the term *stress* refers to a physiological state, while the term *anxiety* refers to a psychological state.

In chamber music contexts, the musicians develop complex inter- and intra-dynamic relationships because these groups possess both working and social characteristics. This might be argued based on the observations that a working group is the result of integration and cooperation between its members (e.g. Levin, 1951), while the social group reflects the interaction (Quaglino, 1992; Levine & Moreland, 1990; Johnson & Johnson, 1991; Davis, 1973) and "feeling together" of all members (Lewin, 1972). In the particular case of an instrumental duo such as the violin-piano duo, the dynamics of this social working group might be quite special because it is constituted only by two musicians. The close working environment facilitates inter-relationships in which musicians are "constantly elicited from the other […] as the average reaction to a given person is the partner effect for that person" (Kenny & La Voie, 1984: 142). Therefore, it seems rather important to assess the impacts of change of partner in performance on the pianist's perceptions and psychological and physiological reactions, as they might be different depending on the synergetic and empathetic responses to the other.

Other aspects may be found in the instrumental duo, such as synergy and empathy. Based on the dual concept of "cooperating work and inner-feeling", the duo obviously reflects the phenomenon of synergy, which is the result of the interaction between all elements that constitute a system that produce an effect different from the one produced by the simple sum of all individual components. In the context of organizational behaviour, synergy realized through co-operation and interaction. Thus, it seems natural that synergetic behaviours will be different between different duos or other small chamber-music formations. Empathy is also another important organizational behaviour aspect when investigating duo performance, as the energies unite, or converge, towards a common goal and in an emotional environment of a strong interpersonal connection. Empathy is, according to Hoffman (2001), the vicarious affective response to others, i.e. an affective response appropriate to the situation of another person, not the situation itself. The term was first used in the early twentieth century, by the German philosopher Theodor Lipps (1851-1914), to indicate the relationship between the artist and the observer, who normally projects him/herself in the artwork. In contemporary psychology

and neuroscience, empathy is a kind of “emotional intelligence" (Mayer, DiPaolo, & Salovey, 1990) and can be divided into two types: 1) cognitive - related to the ability to understand the psychological perspective of other people and 2) affective - related to the capability to experience emotional reactions observing the experience of others. In this sense, the instrumental duo is a unique opportunity to understand the internal dynamics and to observe the reactions of the same pianist with two different violinists.

As performance anxiety has been pointed out as one of the most common factors affecting the quality of the performance in solo and *ensemble* cases, both positively and negatively (Eysenck & Calvo, 1992; Papegeorgi, 2007), it is logical to consider music performance-related anxiety (MPA) as one possible mean to understand the impacts of change of partner in performance quality of the duo.

Mal-adaptive MPA is one of the most common problems affecting musicians (Brandfonbrener, 1999). In one study, more than 70% of orchestral musicians reported to have performances negatively affected by anxiety, at least at one point during their careers (*Ibid*). For about 15% to 25% of musicians, MPA is critical to the point of impairing their performances (Steptoe, 2001).

Given the problem of negative anxiety, several studies have been carried out to understand these phenomena and to find possible preventing and coping strategies (Nagel *et al.*, 1989; Orman, 2004). Among several factors affecting MPA, individual characteristics, repertoire and circumstances of performance have been nominated as the most influential (Valentine, 2008; Papageorgi, 2007). For example, individual performances associated with higher levels of anxiety have been compared with group performances (*Ibid*.). Also, performances involving examinations or auditions have been associated with higher MPA than rehearsals or concerts (Lehmann, Sloboda & Woody, 2007).

So far, MPA has been studied within the specific contexts of solo instrumental/ singing performance, operatic choral artists, orchestral musicians, instrumental/singing students, amateurs and professionals, and children as music practitioners. Within the specific context of chamber music, studies have been mainly focused on rehearsal dynamics (Davidson & King, 2004), structure and organization of practise (Ginsborg *et al.,* 2006), musician’s role in the rehearsal (King, 2006), co-ordination between partners in performance (Williamon & Davidson, 2002), social interactions between group members (Ford & Davidson, 2003; King, 2006), musical interaction and negotiation techniques (Davidson & Good, 2002; Davidson & King, 2004), and modes of communication,

including visual, gestural, aural, verbal and non verbal communication (King & Ginsborg, 2011). To date, there have been no studies focussing on the understanding of MPA levels in chamber music contexts and, more specifically, within occasional and consolidated instrumental duo partners.

1.2. Motivation

Chamber music can be considered as the most intimate and privileged environment for music making (Kilburn, 1904; Salvetti, 1983). From the practical standpoint, many questions have surfaced from the author's first-hand observations of working dynamics within the members that constitute chamber groups, both on and offstage.

One of the main motivations of this research is to find out why the author had certain reactions in performance with the long-time partner. Anecdotally, several musicians report different reactions and feelings when playing with different musicians. This type of information, although based on musicians' perceptions, constitutes a valid motive for further investigation, aiming at understanding the complexity behind the musical, and body-mind interactions between members of a musical *ensemble* when assessing the possible impact on MPA and overall performance quality. Thus, it was determined to look at the reactions of psychological anxiety and of physiological stress on performance in members of the consolidated and occasional duo and to determine what indicators would be more representatives (repertoire, venue, and partner – this latter only for the pianist).

Through personal experience as both teacher and performer of chamber music, the author has observed many situations, positive and negative, in *ensemble* performance: moments that offered challenges and opportunities to surpassing hurdles in order to maintain the sense of *ensemble* and to witness further growth. During these moments, the author was always interested in trying to understand the emotional reactions before and during performance. Having observed, before entering stage, the isolation of some, the excessive talking of others, the embarrassment of frequent visits to the bathroom, the author always thought that a musician who is not seeking and does not work on his/her own intimate emotional state (such as the one being associated with MPA and stress levels), not only has a difficult life, but probably also will come to harm the musical performance itself (and maybe others) (Asch, 1951; Fatout, 1992; Massey, 2002; Dasborough, 2006). Thus, it can be observed that such qualities as synergy, empathy, and inter/intra-personal communication are always present, even if in varying degrees.

By working together and sharing the same values and objectives, the united group action may have the potential to produce highly rewarding results that exceed expectations. This concept of synergy and empathy in chamber music can be understood as *the group performance gestalt*. In other words, performance in chamber music contexts is more than the sum of the parts played by all members, as there are important synergetic elements in group-work, such as effective communication and convergence (Syer, 1991).

Like a non-musical work and social group, a chamber music group has, to a greater or a lesser extent, its own identity. It functions according to the synergistic dynamics created between the individual members. The author believes that musicians, even after their musical identities have been defined, rarely talk about synergetic and empathic communications (or their absence) through the acknowledgment of MPA. Anecdotally, one could say that there is almost an unspoken vow of silence – a kind of bad luck omen – if admitted or spoken of. Often, each musician has a tendency to hide MPA when it is a problem, hoping that it will go away.

According to Howard Gardner[1] (Project Zero leader at Harvard University), the capacities for inter- and intra-personal communication are evidences of human intelligence. People possess these capacities to greater or lesser degrees and citing Gardner there "doesn't exist two people have exactly the same combination of intelligences" (Turin, Interview 10/04/1997[2]). We have all been gifted with senses and our

[1] Howard Gardner (b. 1943) is "the John and Elisabeth A. Hobbs Professor of Cognition and Education at the Harvard Graduate School of Education. He also holds positions as Adjunct Professor of Psychology at Harvard University and Senior Director of Harvard Project Zero. Among numerous honours, Gardner received a MacArthur Prize Fellowship in 1981. He has received honorary degrees from twenty-nine colleges and universities, including institutions in Bulgaria, Chile, Greece, Ireland, Israel, Italy, South Korea and Spain. In 2005 and again in 2008, he was selected by Foreign Policy and Prospect magazines as one of the 100 most influential public intellectuals in the world. Most recently, Gardner received the 2011 Prince of Asturias Award for Social Sciences. The author of twenty-eight books translated into thirty-two languages, and several hundred articles, Gardner is best known in educational circles for his theory of multiple intelligences, a critique of the notion that there exists but a single human intelligence that can be adequately assessed by standard psychometric instruments". (From http://howardgardner.com/biography/, accessed on October 7th, 2013 7 a.m.).

[2] Adapted from http://duo.mediamente.rai.it/home/bibliote/intervis/g/gardner.htm, accessed on February 11th, 2013 7 a.m.

perceptions go far beyond simply to see, hear and physically feel. For effective chamber music performance, all possible forms of communication are necessary (Goodman, 2008); the ability of learning to hear, see, and feel beyond the physical plane becomes then another dimension of communication, which, with discipline, leads to a higher degree of perception (Cheli, 2001). Every work based on this kind of development requires strong will and perseverance because often, according to Leonardo da Vinci, the human has the tendency "to look without seeing, to listen without hearing, and to touch without feeling" (Baldassarre, 2006: 77). The daily obligations and bonds to which one is tied up are quite demanding, and if there is not a space for introspection, even for a few minutes a day, they will compromise the development of these faculties. The training and discipline in applying these attributes is what will give us security and confidence to the development of these perceptions. Thus, by becoming more enlightened and aware, one realizes what is to feel, see, and hear (listen) more intensely and how much this is important for ones growth on an intra-personal level.

Since the Duo has an intimate setting, it allows for an in-depth look at its function on many levels. By asking these questions − how would a performing musician be affected in terms of MPA and physiological stress if the partner would change, even if on a temporary basis, and what would this change reveal in terms of the overall quality of performance and resulting synergy between partners? –, the author is motivated to find out how and why she reacts in certain situations. Changing partners in performance in a small musical *ensemble* - in this case the violin-piano duo - thus constitutes a valid approach to address this issue.

As synergy is a non-measurable parameter (although it may account for differences in performance quality when changing partner in performance), it is not possible to understand, still, the extent to which it affects music performance. Perhaps, as anxiety and stress levels affect human relations and behaviours (Albrecht, 2010), (and *vice-versa*) measuring MPA and stress levels in performance among duo members will encourage a more profound understanding of these inter-relations. Perhaps by understanding stress levels and MPA of a pianist when changing partner in violin-piano duo performance, one may understand the impact of synergy and empathy as well in performance quality, the latter here considered as musical meaning.

Levels of MPA depend on the performance situation, including for example, the place of performance, the type of audience, the type of performance configurations (group or *solo*) and the type of repertoire (Papageorgi *et al.*, 2007). Thus, levels of MPA in

instrumental duo contexts will be influenced by a range of factors, including the dynamics that develop within the context of the group, besides the other factors that have been appointed as main manipulators of MPA. In other words, the individual must deal not only with his/her own anxieties, his/her own fears and his/her own expectations, but also rather with the anxieties, fears, and expectations of the "other".

1.3. Aims

This research project aims at investigating the pianist's reaction of changing partners, venues and repertoires in performance, through observations of MPA and stress levels of the duo members and self-reflections by the pianist. The rationale behind such a goal is to question the pianist's reactions with the long-term partner of the consolidated duo in order to assess the impact of group interactions.

Moreover, if one considers music as a mean of communication, the change partner in duo, of course, may change or affect the way it is received. In fact, music as communication is an extremely complex phenomenon; there are constant feedback loops between the performer (messenger), the performance itself (message) and the audience (receiver), so that the channel between messenger and receiver is not linear but rather composed of different levels (Miell *et al.*, 2005). In a group such as violin-piano duo, these feedback loops are far more complex as there are to messengers creating a message together and, thus more conditioning factors for message intelligibility. As well, partner change in duo will be subject to perceptual testing by expert listeners.

1.4. Research questions

The central question to this investigation concerns the extent to which changes of partner in performance affect anxiety and stress levels of the pianist in performance, when other possibly affecting factors (such as repertoire and performance venue), remain the same. In other words, are stress and MPA markers of playing with different partners in performance? (ii) What are the opinions and views of other consolidated duos on MPA and stress management during performance? (iii) Do MPA and stress levels, as a consequence of changing partner in performance, affect the overall quality of duo performance? If yes, do expert listeners (i.e. other musicians) perceive these differences and these influence their decision-making towards performance preferences? (iv) What

underlying causes (personality, self-concept, tasks, expectations, or feelings) could account for changes, in both psychological and physiological markers, during music performance for a pianist when playing within a consolidated or a just newly formed instrumental duo contexts?

Due to the lack of literature on the reactions of the pianist when performing with different partners in performance in a duo type of *ensemble*, the methodological approach chosen was an exploratory one: a case study investigating two violin-piano duos sharing the same pianist (the author of this work). By applying qualitative and quantitative approaches of data collection, focussing on both psychological and physiological dimensions of the pianist and the violinists (1 & 2), one might hope to disentangle the complexity of the dynamics underlying violin-piano duo music performance when changing partner in performance: from a colleague with whom the pianist shares a life of performance experiences by a colleague with whom the pianist never played before. By understanding the differences and commonalities between performing in a well-established and in a newly formed duo, as well as observing the synchronization and dialogue of the duos, considerations of what parameters affect more the performance quality of the duo will become clear.

The case study here discussed involves two violin-piano duos: one constituted by the author of this work (i.e. the consolidated duo); and the second just formed for the purposes of this investigation, constituted by the author and a violinist teaching at the university (i.e. the newly formed or occasional duo). The following designations are used to identify the subjects and each duo: P (pianist); V_1 (violinist of the consolidated duo); V_2 (violinist of the newly formed duo); PV_1 (pianist playing with violinist 1); and PV_2 (pianist playing with violinist 2); CDuo (consolidated duo); ODuo (occasional duo). Each of the violinists, both males, had similar professional and educational backgrounds. The pianist is a female.

Qualitative and quantitative dataset were collected, including: (i) psychological assessments of the musicians using standardized tests for MPA, personality, self-concept; (ii) a personal diary of the rehearsals and concerts, kept by the pianist; (iii) a non-invasive immune-essay cortisol stress monitor; (iv) cardiac monitoring of the musicians through an invisible T-shirt with Holter-type system developed at the University of Aveiro, called *VitalJacket®;* (v) semi-structured interviews with members of long-term duo chamber music groups; (vi) semi-structured interviews with violinists participating in the present study; (vii) perceptual evaluations of the performances by two groups of expert

listeners. The psychological and physiological dataset were collected for a total of eight recitals – two series of four recitals each. These were performed by the two duos (i.e. CDuo and ODuo), within a five-month period. Each series was performed in the same two venues: European university (Venue A, VA) and a secondary music school (Venue B, VB). The repertoire was different between the two series: for the first series, repertoire that was extremely familiar for CDuo (but not for ODuo) was performed, whereas for the second series, only new repertoire for all participants was performed. To create a situation of maximum stress, a "first sight-reading" piece was performed for the first time onstage by the duo members; thus, this piece was given to the couple approximately one week before every recital and only individual practice occurred before playing together on stage without any duo rehearsal.

As both psychological as physiological markers will be studied, these dataset enables a deep understanding, under two perspectives (of the pianist and of the others) about the pianist's anxiety and stress phenomena occurring during duo performance when changing performance partner.

1.5. Structure of the thesis

In order to answer the above questions, the written work here presented is organised into three main parts: Part I presents a contextualization of chamber performance, and more specifically, duo performance, including concepts of general group interaction and its application to chamber music, the literature review about anxiety; Part II is focussed on experimental study, with the semi-structured interviews undertaken with consolidated international duos in order to determine further tests. Those decided upon were in the realm of both psychological and physiological markers. These are complemented by interpretations of the obtained preferences of expert listeners on performance outcomes of the two duos: results obtained and discussed the analyses of them with possible hypothesis of explanations about different reactions when the pianist is working with other musicians, in a chamber music context of a duo performance. Part III presents the pianist's diary kept during the whole study and psychiatrist's interpretation of it, which covered the rehearsals and the eight performances undertaken. As well, interviews with the violinists who participated in the study are conducted. Final conclusions are offered, as well as suggestions for future work derived from the results of

this study; finally, Part III presents results obtained and discusses the analyses of them with possible hypothesis of explanations about different reactions when the pianist is working with other musicians, in a chamber music context of a duo performance. Final conclusions are offered, as well as suggestions for future work derived from the results of this study.

CHAPTER 2: HISTORICAL OVERVIEW OF CHAMBER MUSIC

2.HISTORICAL OVERVIEW OF CHAMBER MUSIC

2.1. Defining chamber music

In order to contextualize the reader towards a better understanding of the group dynamics in such a particular performing context as duo performance, the next section provides a brief historical overview of chamber music, which, in turn, has led to the birth of instrumental duo performance, a specifically the violin-piano duo.

The term "chamber music", is commonly used to distinguish small group performances from "symphonic music" and "operatic music" (Salvetti, 1983: 439). It owes its *raison d'être* partially due to its instrumental or vocal structure; in other words, the performance of each part (or voice) is played by a single performer (e.g. a string quartet or a violin-piano duo). Chamber music is defined as “any kind of music or composition destined for a limited number of performers” (Garzanti, 1983: 128). In one edition of Grove (1984), the term chamber music is eluded as “music for small *ensembles* of solo instruments, written for performance under domestic circumstances in a drawing-room or small hall before an audience of limited size or indeed without the necessity for any listeners” (Grove, 1984: 113). According to Kilburn, “of all the musical forms, this of chamber music is the most adapted for home consumption, and its cultivation by any community may safely be taken as a strong proof of an advanced condition of musical taste” (Kilburn, 1904:12-36).

From the above definitions, it becomes evident the reasons for limiting the category of chamber music to usually six elements in international competitions of today. The goal is to perform music in such an inter-personal contexts that allow for, not only interactions between members of groups, but also, intra-personal interactions. Thus, one might argue that chamber music acts as, on the one hand, an opportunity for those solo performers to share personal experiences through music (Adler, 1965) and, on the other hand, an interplay of preparation for bigger social interactions through music, as those happening when playing within an orchestra. However, for the case of instrumental duo performance as the one here explored (i.e. violin-piano duo), anecdotally one might also argue that another possible concept is that the pianist acts as a supporter of a soloist, the violinist. This misconception that may still exist in contemporary music performance scenery may be related to the historical birth of instrumental duos. As discussed later in this chapter, the pianist’s role in performance developed from the *basso continuo* (b.c.) that accompanied the violin, thus considered the first form of a violin-piano duo. To further

explore when, in music history, a violin-piano duo emerged as "chamber music", the next section provides a brief contextualization of chamber music history, followed by a section on the evolution of instrumental duo, paying special attention to violin-piano duos.

2.2. History of chamber music

The conceptualization of "chamber music" originated during the late Feudal court period in Italy as a type of "cultural entertainment" that was specific to a place, the *camera* (Salvetti, 1983). This style developed essentially from meetings between the most eminent cultural figures of those days, thus having doctrinal and literary affiliations. Thus, gradually music assumed an important role in society, becoming part of a cultural attitude of those who were skilled in singing and in handling any type of instrument (Salvetti, 1983). This practice started mainly by young bourgeois and noble intellectuals during the thirteenth century in Florence. In Italian cities, an art form of a small group of people, although not exclusively, began to emerge. Dante called it "*dolce stil nuovo*". This new style found the grounds to grow in the relations between University of Bologna, Florence, and France. In this context, the classical and the popular themes were mingled, as music came out of the religious realm. The exaltation of wine, women, and gambling became the sign of a strong lay culture. The production of Guillaume de Machault (1300-1377) gives us a precise idea of this bipolarity: his motets are in part intended for liturgical ceremonies of the chapel yet they also have a function of a "civil" nature. However, the latter were still destined for a restrictive or "reserved" entertainment. Therefore, in the fourteenth century court, "chamber music" starts to be a part of the cultural and artistic activity of the most intimate and refined kind (*Ibid*.). A great emergence of instrumental treaties took place between the fifteenth and sixteenth centuries, giving a series of precise indications for the diffusion of an art that had been almost exclusively reserved for few experts until that moment.

One might argue that, at this moment, there was a change in the function of social and artistic performance, and thus of the performer − both vocal and instrumental. The function of the performer is now repositioned to become one of the central characters in the Renaissance court. The moment in which the interest of the educated man is not already fully satisfied by just listening to liturgical music in churches, performance venues are created, and multiply. The musician ceases to be an employee and is relegated to the

position of *dilettante* (amateur), which in some ways is much more prestigious because it represents the antechamber of professionalism and popularity (Salvetti, 1983: 442).

At this particular historical moment, when profane music was associated with the aristocratic field, was the birth of scholar and music academies (Salvetti, 1983). In these Academies, music was not the only subject of study, but those of philosophy, poetry, science and other arguments were discussed. These academies spread so that during the first half of the sixteenth century, nobles began to study singing and instruments and the acquisition of some musical knowledge became one of the requirements in education. The most famous academy was the Platonic Academy (1459), founded by Marsilio Ficino (1433-1499); however, *Camerata de 'Bardi* or *Camerata Fiorentina* (1573) played an important role in shaping chamber music environments of high and passionate intellectuality (Salvetti, 1983); these meetings to play together happened regularly (once a week). In other countries, such as Germany, chamber music was also developed outside the Court. Martin Luther (1483-1546) created the *Collegium Musicum,* a popular institution founded in many cities from the Lutheran reform until the eighteenth century. It was a form of association of citizens, often in relation to ecclesiastical universities or schools, which operated at unofficial sites such as, for example, the *Zimmermann* coffee shop, to the glorious Leipzig's *Collegium* headed by Georg Philipp Telemann (1681-1767) and then by Johan Sebastian Bach (1685-1750). With the *Collegium Musicum,* the importance of the *bourgeois* citizen in chamber music was therefore encouraged. Just to give an example, in England, Thomas Britton (1644-1714), a merchant, initiated a serious of concerts that become famous so that, what initially was a free entrance, become a subscription (Kilburn, 1904).

Chamber music in the Classic period follows a path of profundity addressed to very prepared connoisseurs and a very knowledgeable audience. This is evidenced by such compositional techniques as the *fugato* style found in many late quartets of Haydn and Mozart, or the adoption of greater freedoms in relation to sonata form, or with respect to traditional harmony (Salvetti, 1983).

In the second half of the eighteenth century, chamber music follows two different directions, which cannot be rigidly delineated. These directions are found among the Italian violinists and composers on the one side and the Viennese violinists and composers on the other. Most trios, quartets and quintets written in this period aimed to create "enjoyable entertainment". The type of writing that best exemplifies this intention is the *concertante* or *dialogata*. In this composition, different instruments sustain the melodic

line, which the others follow (Salvetti, 1983). This experimentalism, especially typical of the quartet, culminates in the last Beethoven quartets, in the field of great development of counterpoint (the *Grande Fugue* op.133), new modes (*Canzona di ringraziamento offerta alla divinità da un guarito, in modo lidico* from Quartet op.132), or even free aggregations culminating in the Beethoven's Quartet op.131. While the first production of chamber music in this time was an initial tendency to "play" in small environments, musical consumption of the nineteenth century was, on the other hand, of larger scale and environments. In the symphonic concerts in Italy and France, around 1870, Beethoven quartets were common as part of the played repertoire. With this format, chamber music lost its characteristic of being an art of intimate confession (Salvetti, 1983: 445).

Chamber music stimulated the great composers to produce their best works. The quartets of Mozart and Beethoven, for example, as well as Brahms' works, are considered among the deepest and most moving in the entire musical literature, in spite of involving "only" four musicians. *Lieder* is another example of such emphasis on the best qualities among composers. For example, Schumann wrote approximately 150 *Lieder* during 1840 ("the year of the song") and created the magazine *Neue Zeitschrift fur Musik*, in wich Schumann wrote regular critical essays to compositions of that time, amongst which one can find the enthusiastic exaltation that he made to *Lieder ohne Worte,* by Mendelssohn. Orchestral *Lieder* was another form that emerged during this time, with Richard Wagner (1813-1883) and Gustav Mahler (1860-1911). Through these orchestral pieces, *Lieder* gains another dimension.

The idea that chamber music was born for a specific audience was regained with the avant-garde music, which, until today, is aimed at a particular audience or written for a specific purpose. The works are written to be performed at a Festival or other specific events. In the fifties, one can find a composition that reflects the specific purpose to which was written: "Silence" by John Cage (1912-1992). This is a clear example of a choice of subject that avant-garde composers had, for which only few people may understand - "an approach that reproduces the relationship musician/listener in times of sharp intellectualism of the small magic circle of chamber" (Salvetti, 1983:448).

One might say that chamber music was never intended for large audiences until the modern era when, given to commercial demands, chamber music concerts take place in any kind of space, even in concert halls designed for symphony orchestra. This, partially, might be the reason for changes in modern compositions written for chamber groups. "It is also now the custom to perform chamber music in large concert halls. No doubt, so far as

the public is concerned, this is convenient, and maybe it is, financially essential. None the less, it cannot but be regarded as a perversion, for such music is heard to the greatest advantage under what maybe called domestic conditions" (Kilburn, 1904: vii). In fact, with this change, much of the intimacy was unfortunately lost and, with it, a refined and welcoming way to communicate. The large concert halls ask for bigger sounds and this inevitably requires musical meaning gestures which goal is not any longer "intimate". Nevertheless, chamber music cannot compete (in terms of level output) with symphonic music, or even less, with opera where, in addition, there is the visual effect of the scenery. Thus, one might conclude that, in spite of losing its "intimate" quality when played in such acoustic conditions, chamber music will continue to be appreciated by a "special" audience who loves the familiarity and communication achieved when few people play together.

As the author of this work who has played in a violin-piano duo for many years (fourteen), it is of her personal interest to understand the dynamics of such a small *ensemble* group, not from an audience point of view, but rather from her own perspective. The interest now is not in the phenomena of changing acoustics and the size of the audience, as other authors have been interested, but rather understanding the psychological and physiological reactions of the pianist in the duo when playing with different partners. A lack of attention is found in the literature concerning these issues, as the majority of the studies have been dedicated to the history of chamber music, verbal and non-verbal communication between chamber music members, in both rehearsal and concert settings (Goodman, 2000; Goodman, 2002; Shaffer, 1984, Appleton, 1997). Also, the results of a literature survey in several data-bases (*Scopus, Web of Science, Jstor*), no studies have been found concerning specifically duo history, evolution or dynamics between duo players. Thus, the following section represents the first attempt to provide a brief view of duo history and evolution, including possible definitions. Then, one might concern other aspects that may explain group dynamics within a musical duo, such as the conceptualization of social and working groups applied to music making.

2.3. The evolution and conceptualization of instrumental duo

2.3.1. Definitions of duo

From the previous section, it became evident that chamber music definitions much depend on historical contexts. The same applies to the definitions of musical duos. Considered a very specific form of chamber music with regard to the fact that only two musicians are involved, definitions varied according to whether the musicians in the duo have or not experience of playing together. One of the definitions found in the literature describes a musical duo as "the not occasional *ensemble* formed by two soloists of same level who perform a concert activity in common" (Garzanti, 1983:258). Thus, shared performance experience in music making through a long period, can be considered as a requirement to define a musical duo. Other definitions do not consider this long-lasting experience of playing together as important. Rather, what becomes necessary to define a duo would be to play the same instrument or different instruments, providing that both assume equal importance within the group: "instrumental *ensemble* of two concert artists who generally play the same instrument; if different instruments are played, it is assumed that the two must have the same importance and that are perpetrators that share and enjoy equal celebrity" (Utet, 1983: 94). The same idea is reinforced in Grove (1904: 75): "A composition for two voices or instruments, either with or without accompaniment [...] both parts are of equal importance".

Despite the above definitions, where it is clear that time of sharing performance experience together on stage and equally "celebrity", importance and performance level, are requirements for considering two musicians playing together as a duo, it is surprising to see that this is not always the case. To give an example: when looking at posters (referring to old performances kindly provided by the *Teatro alla Scala*, in Milan), one can observe that the performers have not always enjoyed "equal celebrity" (Utet, 1983), or are considered at the "same level" (Garzanti, 1983) or where the parties have "equal importance" (Grove, 1904). Figure 1 provides two examples of cases were the two instruments involved in the performance (violin-piano, on the left, and singing-piano, on the right) do not share equal importance and celebrity, judging by the fact that the name of one of the violinist/singer in the duo is much emphasised as compared to the pianist's name. One might raise the question whether in these cases these constitute duos or are just a concert done by a soloist that needs an accompaniment. Taking into account the importance of the piano parts in the compositions referred as the repertoire of these

concerts, the author of this thesis argues that this is not the case. Therefore, what may be the rationale behind this separation between the violin/ singer and the pianist? Can it be, according to the above definitions, the fact that the experience of both musicians in sharing music making is not long enough to be considered as a duo and thus, here, referred as an accompanied soloist?

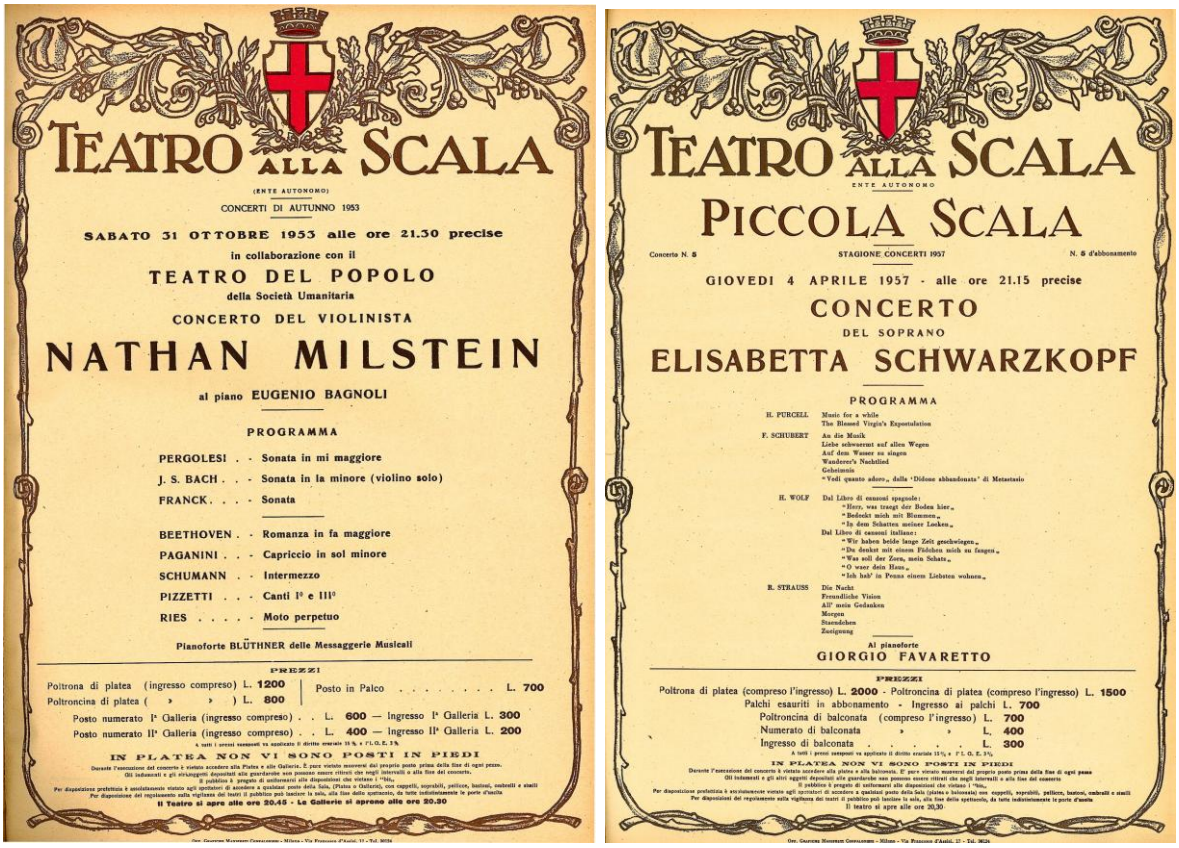


Figure 1. Two advertising posters of performances occurring in 1953 and 1957 respectively, showing the concert program and the musicians involved. Each poster emphasises the name of one of the musicians, on the left the violinist and on the right the singer but not the pianist. These posters were kindly given by Teatro alla Scala in Milan.

To understand the evolution of the above definitions, it is therefore important to look at the historical development of such a specific chamber *ensemble*.

2.3.2 The evolution of the instrumental duo

The first evidence of instrumental pieces written for pairs of musicians goes back to the fifteenth century and refers to viola *da gamba* players (Vinay, 1983). Figure 2 shows

a picture drawn by Lorenzo Costa[3] (1460-1535), displaying the performance of what would be a duo performance by two anonymous viola *da gamba* players.

Figure 2. Painting *Suonatori di Viole,* by Lorenzo Costa (1460-1535) (adapted from Woodfield, 1999. *La viola da gamba dalle origine al Rinascimento,* 102).

Several musical iconographies of the same period can be found, also reproducing images of different instrumental duos, now not constituted by the same instrument, but by different ones. Figure 3 provides an example of such paintings.

[3] Lorenzo Costa (b. Ferrara, 1460; d.Mantova, 1535), also named *il Vecchio*, is an Italian painter. He was one of the most important artists of *Scuola Ferrarese* and the *Scuola di Mantova* of the sixteenth century.

Figure 3. Painting Pala di S. Sepolcro (also called L'ascensione di Cristo) by Pietro Vannucci (also called Il Perugino, dated 1505-1510) showing pairs of musician angels (adapted from http://it.wikipedia.org/wiki/Pala_di_Sansepolcro accessed 22th July, 2013: 8

Other duo performances can also be found, involving organ and lute (see example of a collection for organ and lute of Arnolt Schlick (1460-1517), displayed in Figure 4 (Vinay, 1983).

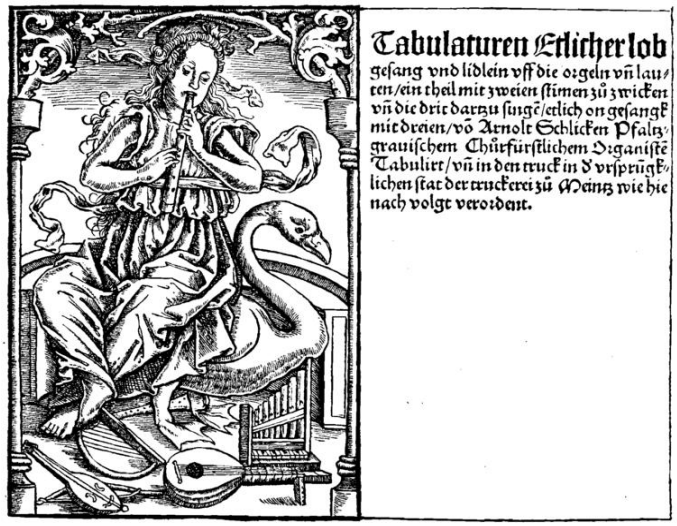


Figure 4. Example of a composition for organ and lute, *Schlick's Tabulaturen* (1512), constituted by several hymns (adapted from http://duo.reuter822.com/2009/1229regina.html, accessed 22th July, 2013: 9 a.m.)

2.3.3. The Instrumental Duo and the Sonata form

The first instrumental duo for which specific music was composed, in terms of structure but also considering the presence of two instruments, is the instrumental version of songs *da cantare et sonare* (Newman, 1983). Thus, the next section will concern the

evolution of this form of music writing, as it gave birth to many compositions and duo music performances.

The oldest *canzone da sonare* exclusively for instrumental group is dated from 1572. It is included in the fifth book of Madrigals for five voices by Nicola Vicentino (1511-1572). This type of instrumental song was called *Sonata.* A noteworthy group of this kind came from Venice, particularly from S. Marco Basilica: between 1600 and 1675 about twenty volumes that contain works for instrumental Duo and Trio were published in Italy, especially in Venice and Bologna (Mangsen, 1991). However, the expression *a due* or *a tre* did not include the accompaniment of the *basso continuo* (Salvetti, 1983).

Among composers of the Sonata there were violinists and organists (Newman, 1983). It is believed that the first and oldest use of the word Sonata, is in *Sonate a cinque istrumenti* by Angelo Gabrieli (1532/33-1586), book printed in 1586, but for which we do not have any trace (Paribeni, 1936).

One of the first important composers of *Sonata* was Giovanni Gabrieli (1554/5-1612). His famous *Sonata pian e forte* in *Sacre Symphoniae* of 1597 is an example, as well as his large collection of *Canzoni e Sonate* (up to 1615). Other examples are found in the *Sonate a 4, 6 e 8* (1608) by Cesario Gussago (1579-1612) and *Sonatas* by Biagio Marini (1594-1663), Massimiliano Neri (1618-1670), Giovanni Legrenzi (1626-1690), and Alessandro Stradella (1639-1682). Also worth mentioning are a few others early composers in Italy who devoted themselves to this repertoire: Salomone Rossi (1570-1630), Marco Uccellini (1603-1680), and Maurizio Cazzati (1616-1678).

The term *Sonata*, which comes from the word *Sonada* (from the verb *suonare* = to play), entered into common usage in the 16th century in order to distinguish from *Cantata* (from the verb *cantare* = to sing). The term *canzon da sonar* indicated a song or *chanson* to be performed with instruments (Garzanti, 1983).

As a form, the *Sonata* was born in the north of Italy where it flourished almost exclusively for more than a half of century, until 1650 (William, 1983). In other European countries such as France, Germany, and England, because of the prolific Italian influence in this field, this kind of *Sonata a due e tre* spread to leading composers such as François (1668-1733) e Louis (1626-1661) Couperin, Dietrich Buxtehude (1637-1707), Georg Muffat (1653-1704), Henry Purcell (1659-1695), Heinrich Ignaz Franz von Biber (1644-1704) (William, 1983: 344-354). This kind of sonata, according to Michael Praetorius

(1571-1621), “is distinguished from *canzone* because of less expansion of counterpoint and a certain gravity of performance, for a greater homophonic delay intended to enhance the sound of the *ensemble*” (Garzanti, 1983: 834) .

2.3.4. The Sonata *“a due e a tre”*

The chamber sonata of the seventeenth century gave rise primarily to two formations, typical of the Baroque: the *Sonata a due* (very often for violin and *basso continuo* realized with the harpsichord, organ, and often other accompanying bass string or wind instruments) and the *Sonata a tre* (usually for two violins and *basso continuo*). The latter was divided into two types: *Sonata da Chiesa* and *Sonata da Camera*. Initially, the substantial difference was found in the distribution of the various movements and in that the *Sonata da Chiesa* omitted the names of the dances.

The Trio Sonata was characterized by the presence of four performers: 2 violins (or wind instruments, or a combination of string and wind instruments), 1 violoncello and a keyboard instrument or *basso continuo.* The latter had the function to strengthen the bass in the left hand and to fill in the central harmonic texture by “realizing the bass” in the right hand. This configuration could further expand to five or more players by adding the bassoon, trombone, or another bass instrument, designed to support the part of the *basso continuo* in a *concertante* way or it could be reduced to only two performers if the harpsichordist performed the melodic voice with the right hand rather than to choose to build the texture of the *basso continuo* (Newman, 1983).

A determining factor for the evolution of the *Sonata* in the Baroque period was the substantial technical progress occurring by string players and their instruments, which led to the predominance of the *Sonata a solo* (intended for violin and *basso continuo*) notably after the appearance in the eighteenth century of Op. V *Sonate a Violino e Violone o Cimbalo, dedicate all’Altezza Seren.ma Elettorale di Sofia Carlotta* (Roma, 1700) by A. Corelli. Following Corelli were other Baroque composers of the solo sonata, such as Tomaso Albinoni (1671-1751), Antonio Vivaldi (1678-1741), Francesco Geminiani (1687-1762), Francesco Maria Veracini (1690-1768) and others until Giuseppe Tartini (1692-1770), at which time the peak of Baroque flowering produced the form *Sonata* in which the number of movements varied freely and also included elements of opera airs inspired by the northern Italian types.

2.3.5. The Sonata "*a solo"* with the *basso continuo*

The appearance of the "solo" *Sonata* owes its existence to four main factors (Newman, 1983: 346):

- The evolution of the violin itself through the work of Antonio Stradivari (1644?-1737), Andrea Guarneri (1626-1698) and Bartolomeo Giuseppe Antonio Guarneri, know as *del Gesù* (1698-1744);
- The progress of violin technique and fewer intonation problems due to the instrument (Heinrich Ignaz Franz Biber 1644-1704), the double strings (Johann Jakob Walthter 1650-1717), different bow strokes (Giuseppe Tartini 1692-1770 and Francesco Geminiani 1687-1762) and virtuosity in general (Jean-Marie Leclair 1697-1764 and Pietro Antonio Locatelli 1695-1764);
- The trend towards more and more homophonic texture in which the 2nd violin went to have a pure function of filling while the bass repeated the same formula with a slower harmonic trend;
- The development of "solo" *Aria,* in all its variety, in *melodramma* and *oratorio*.

All these elements contributed to the fact that the violin became a solo instrument of excellence in Baroque sonata as, for example, in the Six Sonatas and Partitas for solo violin (1720) by J. S. Bach (1685-1750), written for violin without accompaniment (*Sei Solo a Violino senza Basso accompagnato).*

At the same time, the Sonata for keyboard – usually for harpsichord – developed so significantly that contributed to a growing importance of this instrument, rather than its previous unique function of *basso continuo*. This change, which in part led to the reversal of the function of the harpsichordist as an accompanist in a secondary role to the main protagonist, putting the keyboard player at the centre of the attention, or, at least, in an equal position of importance to the other instruments. This phenomenon may have also contributed to the change of musical writing. There was a transition from a single theme to a structure and a texture made of symmetries and correspondences between the instruments. The final result was an enrichment of harmony, colourful and phrased (Newman, 1983). As such, the harpsichord − with Alessandro Scarlatti (1660-1725) before

and Domenico Scarlatti (1685-1757), son of Alessandro and Giovanni Battista Martini (1706-1784) after − reaches also its golden moment and stands out in the landscape of instrumental virtuosity, giving to the harpsichord a new connotation that would also affect future compositions for its rival instrument, the modern *pianoforte*. Even on the outskirts of Europe, in the Iberian Peninsula, evidence is found of the brilliant keyboard sonatas of the Portuguese Carlos Seixas (1704-1742) or the Spanish Padre Antonio Soler (1729-1783) in multi- and often monothematic movements. The practice of adding violin *obbligato* was not uncommon to some of Domenico Scarlatti's solo keyboard sonatas, some of which were not only for harpsichord, but also for organ and *pianoforte*, the latter instrument of which has strong roots to the Portuguese court of King John V (r. 1706-1750) by virtue of frequent performances at that court and by virtue of having the first sonatas dedicated to the king's brother, D. António de Bragança − the 12 *Sonate da cimbalo di piano e forte detto volgarmente di martelletti*, opus 1, by Lodovico Giustini (1685 – 1743), published in Florence, in 1732.

2.3.6. The Sonata from the middle of the eighteenth century

In relation to composition, after a transition period during which Haydn tried multiple combinations in the sequence of movements (*andantino-allegro-presto* or *larghetto-allegro-minuetto* or *allegro-minuetto*), the pattern of the *Sonata* became fixed with Johann (Jan) Stamitz (1717-1757, founder of the Mannheim school) as *allegro* (*sonata* form), *adagio, minuetto, allegro.* This scheme, with some exceptions (such as the replacement of the *minuetto* with the *scherzo* in Beethoven, or the omission of the *minuetto* in the sonatas of Haydn and Mozart, or the replacement of the last movement - normally in the form of *rondo* - with a theme and variations), was consecrated by the production of the sonatas for piano solo, violin and piano, or piano (harpsichord) and violin by Haydn, Mozart (Figure 5) and also Beethoven (Figure 6) (Newman, 1983). For example, in the cover of the Sonatas K.26-31 by Mozart (Figure 5), on the title page (first edition) he wrote *Six Sonates / Pour le Clavecin / Avec l'Accompagnement d'un Violon* and the six Sonatas Op. II K. 376, 296, 377, 378, 379, 380 (see Figure 5) in which one reads *Six Sonates Pour le Clavecin, ou Pianoforte, avec l'accompagnement d'un Violon.*

Figure 5. The cover of Mozart's Sonatas, part of the Biblioteca Mozartiana Eric Offenbach (BMEO): Six Sonates / Pour le Clavecin / Avec l'Accompagnement d'un Violon. One notes that here the role of two instruments is inverted: violin accompanies harpsichord (adapted from http://pds.lib.harvard.edu/pds/view/7814183?n=1&imagesize=1200&jp2Res=.25&printThumbnails=no, accessed 22th July, 2013: 9 a. m.)

The same applies for Mozart's and Beethoven's Sonatas, for *Klavier und Violine* (Figure 6).

Figure 6. The cover of Mozart's and Beethoven's Sonatas, for *Klavier und Violine*, to indicate the reverted situation in which the harpsichordist/pianist was an accompanist (adapted from personal library of the author and http://static.musicroom.com/img/c/f/HN7.jpg, accessed 22th July, 2013: 11 a.m.). Here, the violin is the instrument accompanying the harpsichord/piano.

So, it is thanks to the production of these great composers (Haydn, Mozart and Beethoven) that the Piano *Sonata* or other *Solo* instrument and piano, affirmed itself as the most prestigious musical form in the eighteenth century (Garzanti, 1983), sometimes by placing the word *violine* after the *klavier*.

2.3.7. Instrumental duo without *basso continuo*

The evolution of musical repertoire and the evolution of melodic instruments and the new *fortepiano* led to the acquisition of sources and plausible information about transformation/evolution of sonata form and consequently about duo, because we are witnessing a gradual levelling between the writing of the two instruments.

The instrumental duo, which did not require the use of *basso continuo* and that was composed for two equal instruments, was developed mainly by French composers during the early decades of the 18th century: e.g. Jaques-Martin Hotteterre (1674-1763), Joseph Bodin Boismortier (1689-1755), and Jaques Aubert (1689-1753). Since the middle of the eighteenth and nineteenth centuries, amongst all possible chamber duo combinations, the violin duo was the one most successfully developed. This type of instruments combination was embraced with enthusiasm by composers all over Europe: Luigi Boccherini (1743-1805), Antonio B. Bruni (1757-1821), Giuseppe G. Cambini (1746-1825), Francesco Geminiani (1687-1762), Alessandro Rolla (1757-1841), Antonio Lolli (1725-1802) in Italy; Rodolphe Kreutzer (1766-1831), Pierre Rode (1774-1830), Jaques F. Mazas (1782- 1849) and Jean Baptiste Charles Dancla (1817-1907) in France; Christian Cannabich (1731-1798), Franz Danzi (1763-1826), Ernst D. A. Eichner (1740-1777), Karl Stamitz (1745-1801), Franz Tausch (1762-1817) in Germany; Jan K. Vanhal (1739-1813) and Anton Diabelli (1781-1858) in Austria.

From all available compositions it is worth mentioning the 15 *Duetti* for violin by L. Spohr, together with the *Duetti* by Mozart and Joseph Haydn (these last for violin and viola) and by L.van Beethoven (for viola and cello).

Other duo combinations, such as wind instruments and/or duos for different instruments, were also appreciated. For example, for two flutes [Ludwig van Beethoven (1770-1827), François Devienne (1759-1803), Friedrich Kulhau (1786-1832), Ignaz J. Pleyel (1757-1831)], for two guitars [Mauro Giuliani (1781-1829), Ferdinando Carulli (1770-1841)]; for two harps [Johan Sebastian Demar (1763-1832), Robert Nicholas-Charles Bochsa (1789-1856)]; for violins and guitar [Ferdinando Carulli – (1770-1841)]; for harp and piano [Johann Nepomuk Hummel (1778-1837), François Josep Naderman (1781-1835)]; for flute and guitar [Vincenzo Galli (1798-1858)]; for clarinet and bassoon [Ludwig van Beethoven (1770-1827)].

During the Romantic period in Germany, the term "duo" indicated two types of compositions: 1) for violin and piano, or other instrument and piano as, for example, the *Gran Duo Concertante* by C. M. von Weber for clarinet and piano; 2) compositions for four-hand piano, such as *Duetto* (Vinay, 1983). During the nineteenth century, those forms, with the exception of strings and piano, gradually disappeared.

In the twentieth century, many composers returned to the use of the term "duo" to indicate a work for two equal instruments. As examples: Max Reger (1873-1916), Francis Poulenc (1899-1896), Ferruccio Busoni (1866-1924), Paul Hindemith (1895-1963), Bela Bartok (1881-1945), Igor Stravinsky (1882-1971). A piece of supporting evidence for this claim is the concert programs, posters, and, more recently, CD covers. An unusual example of "duo" in modern times is that of the solo pianist with the electronic partner. Whether or not this constitutes Duo playing, it nevertheless possesses similar synchronization processes.

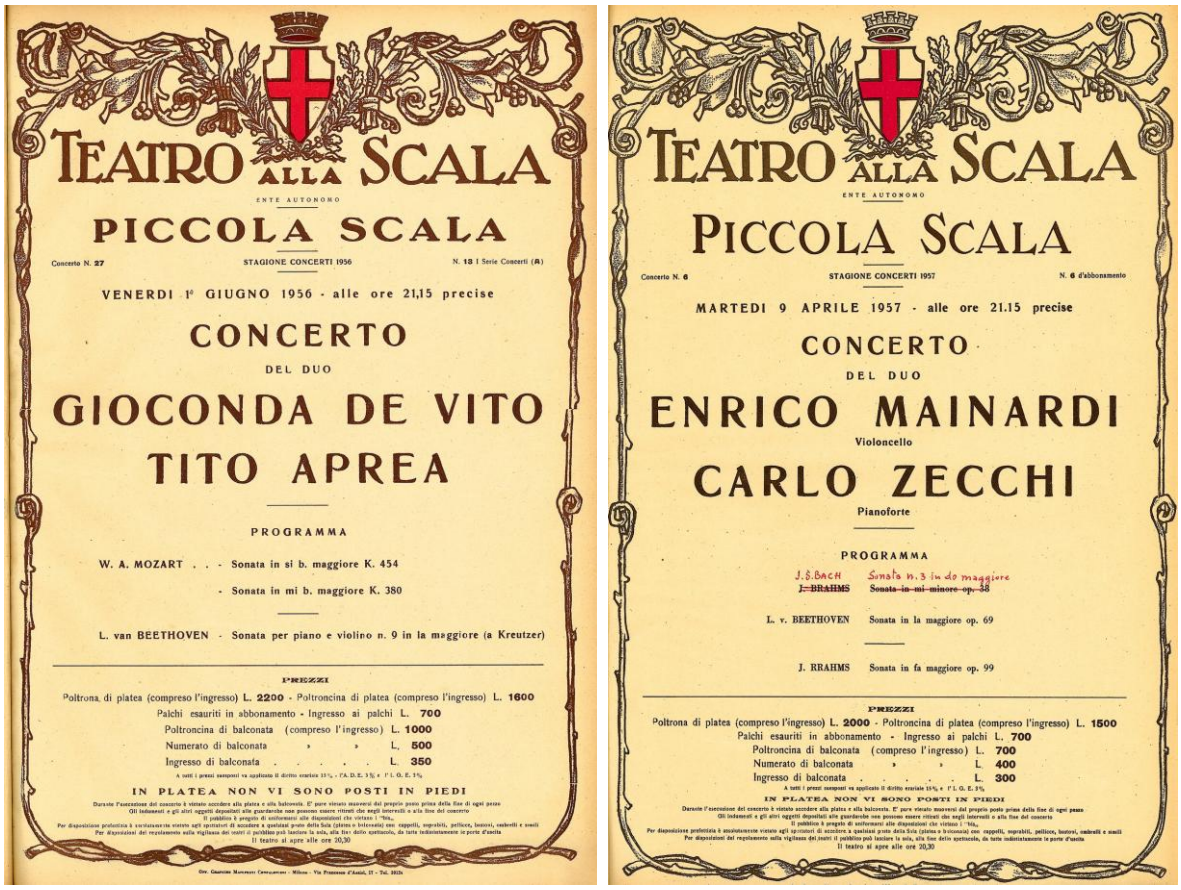
2.3.8. The role of the pianist in the occasional and consolidated instrumental duo

According to Grove (fifth edition), an accompanist is "the performer playing has a rule, with a single singer or instrumentalist usually on the pianoforte, whose part is nominally subsidiary, but who, in all music that matters and especially in music dating later than seventeenth - mid eighteenth – century, accompaniment from a thorough-bass, should be regarded as an equal partner in the interpretation of a type of music which in a broad sense appertains to the category of chamber music" (Adler, 1965:5 cited in Roussou, 2013).

The perception of the role of the pianist in an instrumental duo gradually changed during the twentieth century. It changed from accompanist, considered as an "inferior type of musician" (Cranmer, 1970: 7), to an equal partner and element of the duo. Zechendorf (1953) claims that the pianist's role and contribution was repeatedly not appreciated; in fact, the term accompanist was considered "pejorative" (Katz, 2009: 3). Thus, over the years, this term was sometimes replaced by "collaborative pianist", precisely to give to the pianist a shared role within the duo. In fact, some authors have considered the pianist as a co-performer, meaning collaborative performer. Moore (1943) and Zeckendorf (1953) state that the piano part is a part of the original composition and that melody and harmony

accompaniment, are conceived by the composer as a part that complete and compliment each other, as equal. Adler (1965) refers to teamwork as being the greatest accomplishment between instrumental soloist and accompanist. Cranmer (1970) refers to the accompanist as an equal partner with their soloist and Blank & Davidson (2007) use the term duo to underline the equality between the two performers in the piano duo collaboration.

Reviewing historical posters, kindly provided by the *Teatro alla Scala* in Milan, it becomes evident that, until relatively recent times, both portrayals of the pianist in a duo existed: 1) the pianist that "occasionally" accompanied a great soloist - as we seen in Figure 1 - and 2) the pianist as a “collaborative” and equally important member of the duo as one notes in the follow Figure 7.


TEATRO ALLA SCALA

ENTE AUTONOMO

PICCOLA SCALA

Concerto N. 27 STAGIONE CONCERTI 1956 N. 13 I Serie Concerti (A)

VENERDI 1° GIUGNO 1956 - alle ore 21,15 precise

CONCERTO

DEL DUO

GIOCONDA DE VITO

TITO APREA

PROGRAMMA

W. A. MOZART . . . - Sonata in si b. maggiore K. 454

- Sonata in mi b. maggiore K. 380

L. van BEETHOVEN - Sonata per piano e violino n. 9 in la maggiore (a Kreutzer)

PREZZI

Poltrona di platea (compreso l'ingresso) L. 2200 - Poltroncina di platea (compreso l'ingresso) L. 1600

Palchi esauriti in abbonamento - Ingresso ai palchi L. 700

Poltroncina di balconata (compreso l'ingresso) L. 1000

Numerato di balconata » » L. 500

Ingresso di balconata . . . . . L. 350

IN PLATEA NON VI SONO POSTI IN PIEDI

Il teatro si apre alle ore 20,30

TEATRO ALLA SCALA

ENTE AUTONOMO

PICCOLA SCALA

Concerto N. 6 STAGIONE CONCERTI 1957 N. 6 d'abbonamento

MARTEDI 9 APRILE 1957 - alle ore 21.15 precise

CONCERTO

DEL DUO

ENRICO MAINARDI

Violoncello

CARLO ZECCHI

Pianoforte

PROGRAMMA

J.S.BACH Sonata n. 3 in do maggiore

~~J. BRAHMS Sonata in mi minore op. 38~~

L. v. BEETHOVEN Sonata in la maggiore op. 69

J. RRAHMS Sonata in fa maggiore op. 99

PREZZI

Poltrona di platea (compreso l'ingresso) L. 2000 - Poltroncina di platea (compreso l'ingresso) L. 1500

Palchi esauriti in abbonamento - Ingresso ai palchi L. 700

Poltroncina di balconata (compreso l'ingresso) L. 700

Numerato di balconata » » L. 400

Ingresso di balconata . . . . . L. 300

IN PLATEA NON VI SONO POSTI IN PIEDI

Il teatro si apre alle ore 20,30

Figure 7. Two advertising posters of performances, occurring in 1956 and 1957 respectively, kindly given by Teatro alla Scala in Milan. The name of the duos are emphasised in both posters, De Vita - Aprea and Mainardi - Zecchi. Moreover, the shape of letters has the same size for both instrumentalists. These posters were kindly given by Teatro alla Scala in Milan.

What can be the rationale for these two completely opposite perceptions of the role of the pianist in an instrumental duo? One might argue that marketing may have contributed for such a division of perceptions. On the one hand, it is common that the famous *virtuoso* soloist player, that means, the one attracting bigger audiences, is the violinist, whilst the pianist plays the role of the supporting or "musical filling" instrument. On the other hand, a violinist could not perform the sonatas by Mozart and Beethoven, written "*für Klavier und Violine*", or by Brahms (one can see an example in the Figure 8) or by Franck, without the full cooperation of the pianist, for obvious musical content reasons (note, for example, the indication *"Pianoforte und Violine"* on the cover). Yet, at the same time, the fact that the violinist is standing and facing the audience, and, taking into account the intrinsic melodic characteristics of the instrument, these aspects place him in a predominant position, even visually.

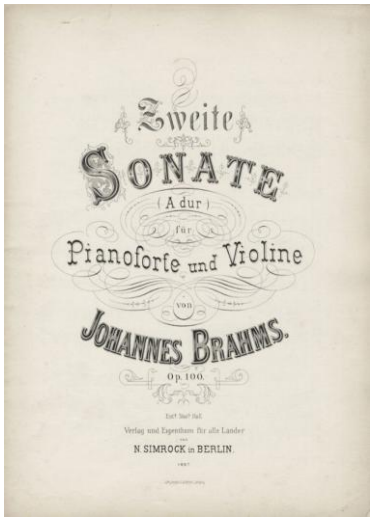
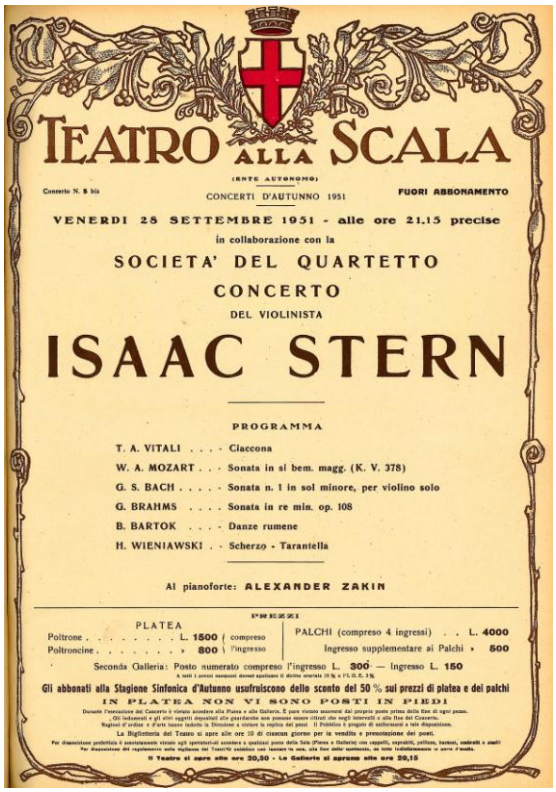


Figure 8. The cover of the 1st Edition of Brahms Sonata Op. 100 for *Pianoforte und Violine* to highlight the importance of the piano part in the musical content (adapted from http://duo.gonnelli.it/photos/auctions/xlarge/4598.jpg accessed 22th July, 2013: 12 am).

It is also important to note that duos as Mainardi and Zecchi held regular concert activity together, while Milstein, Oistrakh, Stern and other important violinists were, for example, in Italy, only for sporadic concerts. In those occasions, sometimes a pianist was "provided" to them by the organization: unfortunately, although excellent, compared to the "famous violinist", was considered a musician of second rank (see Figure 1).

However, on other occasions, the pianist was the violinist's "own" pianist and sadly, from the point of view of the author, the attitude was the same. An example for all is represented by Isaac Stern[4] and Alexandre Zakin[5] who played regularly in duo with Stern during thirty seven years! In spite of this long-time concert activity, Zakin was not considered on a level with him or the pianist in a duo by concert management, as seen on posters, CD covers (Figure 9), and probably, who knows, even the *cachet*.


TEATRO ALLA SCALA

(ENTE AUTONOMO)

Concerto N. 5 bis — CONCERTI D'AUTUNNO 1951 — FUORI ABBONAMENTO

VENERDI 28 SETTEMBRE 1951 - alle ore 21.15 precise

in collaborazione con la

SOCIETA' DEL QUARTETTO

CONCERTO

DEL VIOLINISTA

ISAAC STERN

PROGRAMMA

T. A. VITALI . . . . Ciaccona

W. A. MOZART . . . Sonata in si bem. magg. (K. V. 378)

G. S. BACH . . . . Sonata n. 1 in sol minore, per violino solo

G. BRAHMS . . . . Sonata in re min. op. 108

B. BARTOK . . . . Danze rumene

H. WIENIAWSKI . . Scherzo - Tarantella

Al pianoforte: ALEXANDER ZAKIN

PREZZI

PLATEA

Poltrone . . . . . L. 1500 | compreso

Poltroncine . . . . . » 800 | l'ingresso

PALCHI (compreso 4 ingressi) . . L. 4000

Ingresso supplementare ai Palchi » 500

Seconda Galleria: Posto numerato compreso l'ingresso L. 300 — Ingresso L. 150

Gli abbonati alla Stagione Sinfonica d'Autunno usufruiscono dello sconto del 50 % sui prezzi di platea e dei palchi

IN PLATEA NON VI SONO POSTI IN PIEDI

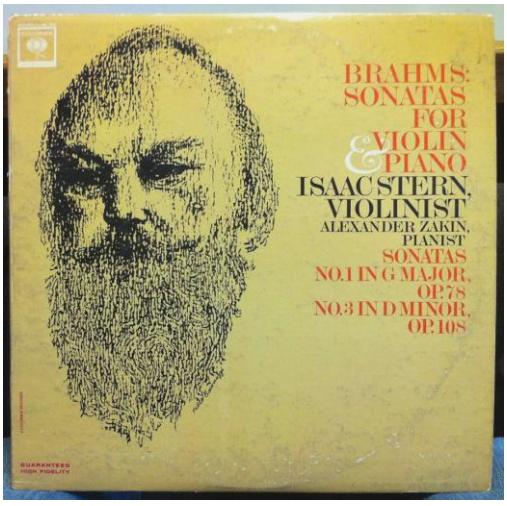


Figure 9. An advertising poster of performances in 1951, showing the concert program of Isaac Stern with Alexandre Zakin (poster kindly given by *Teatro alla Scala* in Milan) and album cover of the LP by the same duo (adapted from http://duo.dustygroove.com/item/663824 accessed 22th July, 2013: 1 p. m). One observes the notable different size of names in both examples.

[4] **Isaac Stern** (1920-2001) Ukrainian violinist naturalized American, was one of the greatest violinists of his time. Within musical circles, Stern became renowned both for his recordings and for championing certain younger players. Among his discoveries were cellists Yo-Yo Ma, violinists Itzhak Perlman and Pinchas Zukerman. In the 1960s, he also played a major role in saving from demolition New York City's Carnegie Hall, which later named its main auditorium in his honour.

[5] **Alexander Zakin** (1903-1990) was a Russian pianist, best known for being the pianist of the violinist Isaac Stern between 1940 and 1977. They appeared together in many of the world's most prestigious concert halls and made many recordings together.

The same strange phenomenon of not considering the pianist at the same level or importance in duo performance can be observed with musicians Oistrakh and Yampolsky. It is important to point out the content of musical program, for example (Figure 10), in which are present Mozart, Brahms and Prokofiev Sonatas. If one is seeking information about Yampolsky, the only news that is found is that he "served as pianist as David Oistrakh's accompanist in several recordings".

Figure 10. An advertising poster of performances in 1951, showing the concert program of David Oistrakh and Vladimir Iampolsky (poster given by *Teatro alla Scala* in Milan) and album cover of the LP by the same duo (adapted from http://duo.discogs.com/viewimages?release=4143844, accessed 22th July, 2013: 2 p. m). It is evident the predominant name of the violinist Oistrakh in both cases.

Another example of this "excess" was the Heifetz-Rubinstein-Piatigorsky Trio, in which Heifetz, despite the high level of his colleagues and the importance of the repertoire played, had to always be, and at all costs, the best. One reads in *Gregor Piatigorsky: The Life and Career of the Virtuoso Cellist* (King 2010: 167) that during a recording session the cellist and the pianist realized that their sound was altered for the benefit of the violin. The author of this book suggests that perhaps the real reason of that lively discussion was the

fact that Rubinstein had discovered that Heifetz received a payment equivalent to double of his cachet. In Figure 11 is found evidence by the different sizes of letters of the names of the violinist, cellist and pianist in the Heifetz Trio.

Figure 11. An album cover of Heifetz-Rubinstein-Piatigorsky Trio where one observes, in the order of size: the name of the violinist, the names of the composers and, in the bottom and with much smaller letters, the names of the pianist and cellist (adapted from http://duo.tower.com/jasha-heifetz-tchaikovsky-mendelssohn-trios-collection-volume-artur-rubinstein-cd/wapi/106544782 accessed 22th July, 2013: 2 p. m.).

2.3.9. General reflections

In the first part of this chapter, a brief history of chamber music was presented, followed by a short contextualization on the evolution of the instrumental duo and the perception of the pianist's role in the duo. Recalling the duo definition cited at the beginning of this chapter, "the not occasional *ensemble* formed by two soloists of the same level who perform a concert activity in common", one might argue that, in order to create a high quality harmonic base in terms of tone balance, on which the other can comfortably be expressive, the role of the pianist and of the violinist must be equal, working side by side on music making, planning, reflection and observation. To achieve such a relationship, time is a precious allied. Based on this idea, two different dimensions of instrumental duos may emerge. On the one hand, an instrumental consolidated duo, involving two musicians, studying together in a continuous manner, and regularly performing. This type of duo constitutes a group for which the members do not live in a situation of hierarchy. Instead, they build up a common long-term project, aiming at the same goals. On the other hand, and by contrast, the newly formed instrumental duo, that plays together occasionally. In other words, these musicians share only short-term

projects. Usually, musicians that are members of a consolidated duo may, occasionally, play with other musicians; however, the commitment compared with the duo has primacy over occasional jobs with other musicians. This priority may be related to the urge “to build" and feel together as a unit. This condition gives birth to specific group dynamics. To infer on the nature of such dynamics and their impacts on music making, the next section is dedicated to the understanding of the dynamics established within social and working groups. The purpose is to identify where duo dynamics can be better allocated, hoping to identify the pianist’s role in two different conditions: a consolidated and newly formed violin-piano duo.

CHAPTER 3: GROUP DYNAMICS IN AN INSTRUMENTAL DUO

3. GROUP DYNAMICS IN AN INSTRUMENTAL DUO

3.1. Introduction

The main goal of this investigation is to understand the psychological and physiological dynamics of a violin-piano duo when changing performance conditions (partner in performance, venue and repertoire) on the overall quality of the performance, from the pianist's point of view. Thus, it seems relevant, before investigating these dynamics and how they change with different conditions, to understand the theories behind group interactions, such as membership, groupship, leadership, synergy and empathy and their relations with interpersonal communication, so important in music making.

As referred in the introduction section, the author believes that a personal "journey" for betterment and better control of MPA will inevitably be reflected in the chamber group because a group is a complex system comprised of individuals in reciprocal relationship among them who have some kind of value bond that determines their psychological profile. A group takes on an identity, is more than the sum of its parts, and it becomes synergistic and emphatic. The instrumental duo, as a "group", is no exception.

Below, the aspects above mentioned are thus explored, presenting them within social and psychological conceptualizations of aggregates*, social group, and working group.*

3.2. Defining the general concept of aggregates, social group and working group

A group is a complex system composed of individuals

> *... in a permanent relationship of reciprocity, and a permanent state of psychological emergency* (Quaglino, G.P., Casagrande, S., Castellano, A., 1992: 23).

The notion of group has been conceptualized as a complex structure in continuous change − a dynamic reality that manifests its own conflicts, tensions, and forces that together produce changes (Lewin, 1951). For each group, the action of everyone modifies the other(s). Reciprocally, individual action is modified by the reactions of the other(s)

(*Ibid*.). There are numerous possibilities of understanding what is a group. From a sociological point of view, it can be considered as a social group, or, in the context of work, a working group or even simple aggregates of people:

i) The aggregates are "gatherings of individuals in unfocused interaction" (Goffman, E., 2006:25);

ii) The social group is considered to exist when individuals interact regularly among them (Lewin, K.Z., 1972);

iii) The working group is a group of people that must integrate and collaborate during a limited period and project (Bion, R., 1961).

Explaining these definitions in further detail, aggregates are transitory groups that are constituted by individuals who exist at the same time and place but who do not share any precise connection (Goffman, 2006). So, an aggregate is a group of individuals characterized by their sheer physical proximity and therefore not organized according to structures and functions. In this sense, the author considers that an aggregate is clearly distinguishable from a group because of its randomness, the lack of structure, and especially the difference in the quality of interpersonal relationships that exist within the group members. Therefore, people within an aggregate are not related to each other. An example of such formation is the audience in a concert. Consequently, the social relations within the aggregate are very limited and mostly have a temporary nature and no impacts on lifestyle and social positions of the people within the aggregate.

In contrast, a social group occurs when individual members interact regularly. The regularity of these interactions unifies the individuals, creating a unity with its own social individuality. For example, a group of friends have interactions that are constant and lead the members to a sensation of "feeling together", thus promoting the development of a social identity (Lewin, 1972), which, in turn, leads to cohesion. If or when the sense of belonging is lost, the social group will experience indifference instead of cohesion. (Quaglino,1992).

Considering now the working group, this might be considered as a "plurality of integration" (Quaglino, 1992: 23). In this sense, the working group tends to integrate psychological connections, harmonizing similarities and differences between group members. This awareness is a mutual need to achieve the resolution of conflict and development of balance to gain satisfaction on individual needs and also group needs.

Individuals, thus, enrich their own individual identity expressing the equalities or differences among them in a realistic work activity carried out collaboratively. This collaborative manner is possible only through trust, ongoing negotiation of objectives, methods and roles, and by sharing decisions (Bion, 1961). To create a working group, there is another dimension in need as compared to a social group**:** a dimension of interdependence that ensures autonomy and survival skills of the group as a social subject. Thus, the acquisition of a consciousness of dependence by all group members of the group or, in other words, the perception of a reciprocal need, is of paramount importance for the success of a particular group (Quaglino *et al.*, 1992). Interdependence and mutual acceptance are the key means to achieve integration: the resolution of conflicts of equality and balance between the satisfaction of individual needs and the needs of the group. In a working group, the individuals do not necessarily have special connections as they are at the same time in the same environment for the realization of a project that is normally limited in time (Di Nubila, 2008). Furthermore, in this type of group, members cooperate with a goal of achieving objectives through methods, rules, and roles and are shared and manifested in a rational consciousness, despite the fact that all individual components know that the group can be and probably will be only temporary (Lewin, 1951).

Moreover, still within a sociological perspective, other group characterizations have been considered and proposed by Charles Horton Cooley (1864–1929). These are primary and secondary groups (Keirns *et al*., 2013).

Primary groups play a critical role in our lives (Cooley, 1992). They are usually fairly small and made up of individuals who generally engage face-to-face in long-term emotional ways. This type of group serves emotional needs: expressive functions rather than pragmatic ones. The primary group is usually made up of significant others, those individuals who have the most impact on our socialization. The best example of a primary group is the family.

Secondary groups are often larger and impersonal. They may also be task-focused and time-limited. These groups serve an instrumental function rather than an expressive one. In other words, their role is more goal- or task-oriented than emotional. A classroom or office can be an example of a secondary group. Neither primary nor secondary groups are bounded by strict definitions or set limits. In fact, people can transition between one group to another. A graduate seminar, for example, can start as a secondary group

focused on the class at hand, but as the students work together throughout their program, they may find common interests and strong ties that transform them into a primary group (*Ibid*.). Taking into account this division, one might argue that a social group integrates the category of primary group, whereas a working group integrates the secondary category.

Transposing these thoughts into music performance, the question that first emerges is whether an instrumental duo will be a social/primary group or a working/secondary group. In this respect it is interesting to observe that in an instrumental duo, as contrasted with larger chamber music groups (such as a trio, quartets, sextets, octets), the conjunction of both last names of the duo performers becomes the identifying name of the duo. That is to say, it seems that the duo may develop particular social-working group characteristics, as opposed to larger chamber music formations. This differentiation may be exacerbated if one takes into account the fact that such a micro group (a duo), although may require a less complex layer of integration as compared to a larger chamber formation, to some extent, requires more profound interpersonal relationships than those of larger groups. These interactions may even impact more directly the performance quality of the duo as compared with the impact of such interactions in larger chamber groups (Manning, 1992). These impacts will be at different levels, taking into account whether the duo or other chamber groups are consolidated (i.e. work frequently for different long lasting projects), or just occasionally formed (i.e. join once, to prepare a single performance).

In consolidated instrumental duos, all aspects of social and working groups are concomitantly present. This is because duo performance requires the interaction of all members, their integration, a sense of "feeling together" (bond), and an equal responsibility in the desired artistic outcome to create and realize a long-term project. The fact that a consolidated duo frequently interacts may create different expectations towards performance outcomes, as in comparison with an occasional instrumental duo. For the latter, it may be the case that the type of interaction may only be skimming the surface of the experiences of a working group.

Developing a consolidated instrumental duo is therefore a matter of building a primary type of group. The sense of "feeling together" leads the members to establish inter-relationships such as those shared in a family. On the contrary, an occasional duo remains within the boundaries of a secondary type of group. These considerations that distinguish both types of groups are graphically represented in Figure 12.

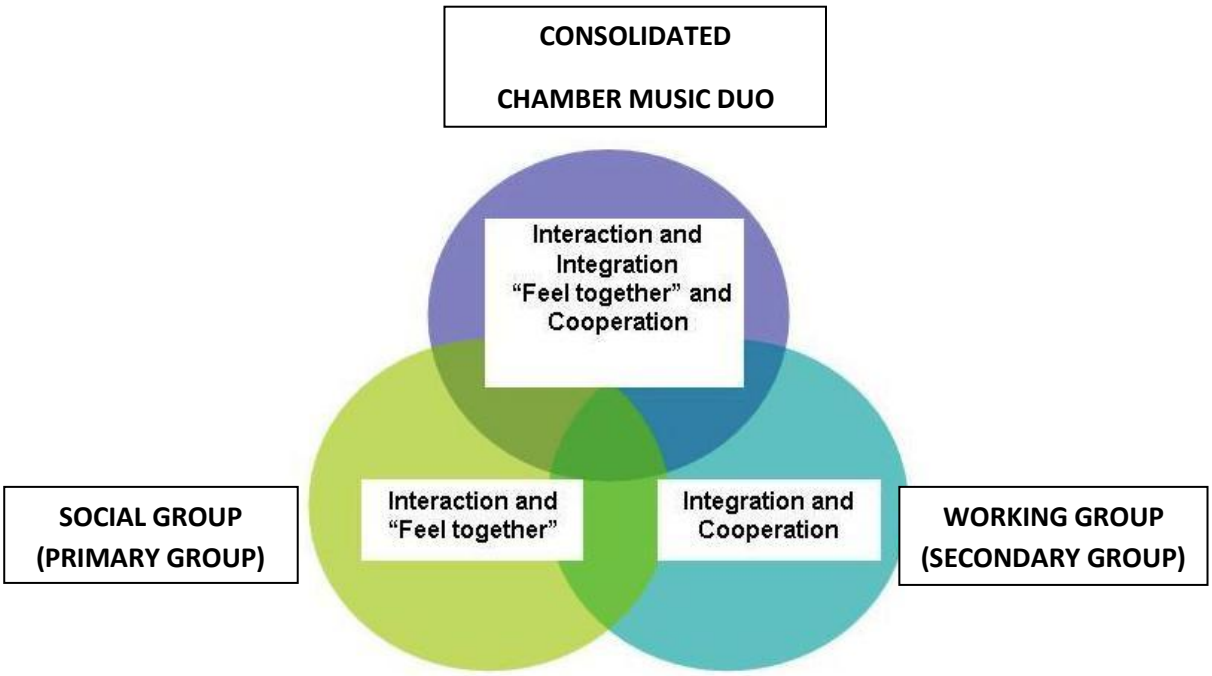


Figure 12. This diagram illustrates the dual social and working group characteristics of a consolidated duo: the members of consolidated duo need interaction (SG), integration (WG), "to feel" together (SG) and also cooperation (WG) to create and realize a long-term project.

For this case study, it seems important to discuss them within two contexts: (i) the perspective of their impact on performance quality (considering music performance as a mean of expressive communication); (ii) the perspective of the musical education of the pianist, who, so far, has paid little attention to group interactions by virtue of concentrating mainly on the education, becoming a solo player and not a chamber musician.

3.3. Impact on music performance

The following section takes into account the theoretical framework of music as a communicational mean. Inferring from this theoretical framework, the purpose is to find possible differences between consolidated and occasional instrumental duos in terms of efficacy of music communication.

Generally, as already mentioned, we can say that in none other type of musical formation the difference between performer and audience, even if only due to the physical distance between them, is reduced to the most intimate essence as is found in chamber

music. Or this would be, at least, the ideal situation. Stated the peculiarity of intimate conversation among people who "are in harmony", chamber music might only be the exclusive appreciation of the musicians who are performing, for themselves and their reciprocal pleasure. So, by making a comparison with solo performance, the author thinks that if this latter can be compared with the intimate reflection of a person − or with the orator's speech in front of an audience − in chamber music the aspect of conversation amongst different people (each of them with their own individuality) makes the "musical speech" more complex, interesting and, even more refined. In fact, every instrument within the chamber music group assumes a primary value like a soloist. Therefore, the whole group formation in this type of repertoire bases itself completely on balancing the parts. In this sense, the duo, as may be seen in a sonata for two instruments, is almost as a "confession" during which the the members have a lot of things to tell each other and a lot of things to discuss − musical topics are better and more closely examined; the dialogue is more clear; and even the mutual understanding, or the "clash", between the two interpreters is more evident, as if it were a "*téte-à-téte*" conversation. Maybe these are the reasons that it is not unusual to find many duos formed from family members such as brothers and sisters, fathers and sons, husband and wife, and engaged couples.

It is a matter of course that differences between the occasional and consolidated duo are surely palpable, since the process of "knowing someone else" requires time to share experiences. We know, in fact, that communication is inevitably an integral part of everyone's life and that our way of communicating is based on our beliefs and experiences (Berlo, 1960). It is an ability that changes over time and is characterized from continuity and dynamic force (*Ibid*.): i. e., the messages received will be elaborated through our personal experience and perception of the world. In practice, everyone "fashions" the message according to his/her own personal codification (Speerber, 1986).

Another considerable aspect of the question is that from both parts (messenger/messenger and messenger/receptor) there has to exist the will of communicating (see Figure 13). In fact, the two abilities − the anticipation and the reaction to other signals − will determine an effect upon the way with which music is performed. So, will this process be easier between two people who know well each other rather than between two people who sporadically meet?

For the author, communication, being something personal, entails a major level of knowledge among people who therefore cannot be merely "acquaintances". It follows that within a consolidated and a newly-formed duo the communication differences will be

evident. However, there is another point of view to consider: communication as something utilized to reach one's own aims through relations with other others (e.g., Canary, Cody, & Manusov, 2003). According to Titon (1996), during the process of music-making it is not easy to understand what people live and experience while producing or listening to it. We can comprehend a musical experience only when we share it in an active form whether as musician or as listener. With these authors, the importance of communication is observed in working with others, which may then be construed to be vital for the optimal functioning of the consolidated duo.

The present exploratory study observes what happens at both the psychological and physiological levels in two chamber music duos with the emphasis being on the pianist's perspective as the common member in both duos through her experience as participant and as observer. Too, with regard to musical communication, it is not less important to know the reaction of the audience, which may confirm, or not, the reactions of the pianist with regard to the musicians' communication and intentions (Gordon, 2006; Gabrielsson, 1996). This is the reason for which a listening test, realized with extracts of the live concerts from this study, examined by specialist musicians, was also included. It gave the possibility to compare the audience preference for the consolidated and occasional duo. The results of the listening tests will tell us even more about the perception of MPA. Does the audience perceive of the musicians' psycho-physiological reactions? Will MPA cause the listener to prefer one duo over the other? Will the aspects of dialogue and synchronization – the latter being the most important qualification of every chamber music group (Goodman, 2008) − be perceived to be the same or different between the two groups?

In Figure 13, a theoretical pattern about communication between the receiver and the two members of the duo (considered as social-working group) is presented.

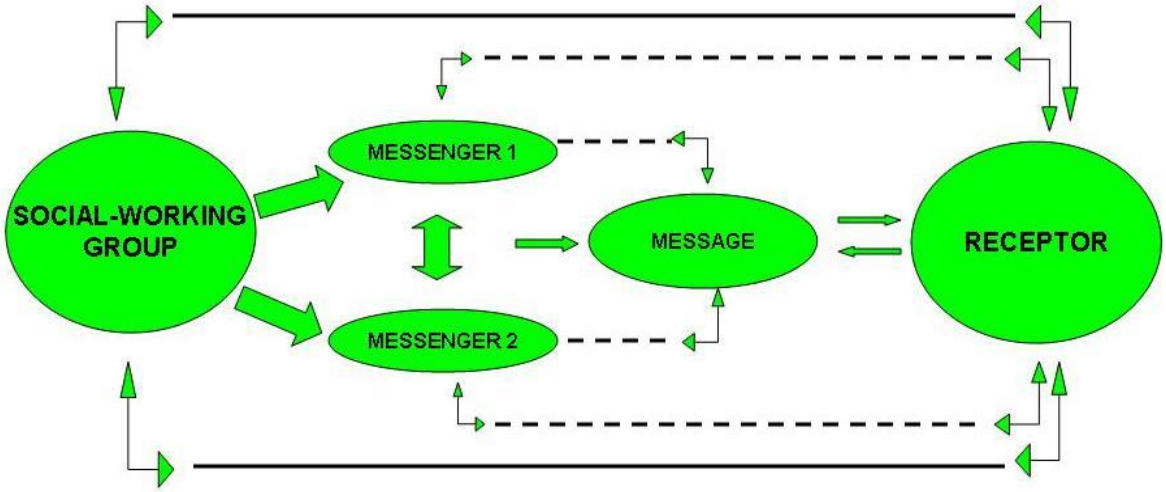


Figure 13. The Figure shows a theoretical model of communication when a consolidated chamber music duo, composed of two members (messengers), interacts, integrates, "feels" together, and also cooperates in order to create and realize a long-term project, by sending a message to the receptor.

3.4. The perspective of the pianist's education: building a consolidated duo

Accepting the need for educating the pianist to be a soloist and also a chamber music member as pointed out earlier on in this chapter, the following section concerns relevant aspects that are included in the development of consolidated chamber music duos with a pianist.

Naturally, when developing and training two musicians to play together, several factors must be taken into account, namely: personalities, objectives, methods, roles, communication, as well as the "climate (…) of building an effective group" (Catena, 2004: 4). Another key factor for the success of a group is the provision of feedback on the interactions and attitudes of all members (Lewin, 1972). In fact, personal knowledge may increase through the "other" (Pisani, 2000). Thus, training two musicians to form a consolidated duo becomes a strategy to improve musical instrumental teaching as well as giving the involved musicians the great opportunity of growing together in the knowledge of effective and affective performance communication - "group-performer unity".

Several studies have shown that three key factors are critical to promote the transition of a musician student into a professional career: (i) the student self-concept as a musician; (ii) the development of coping strategies (as both physical and psychological

demands of such a career are immense); and (iii) the presence of several positive experiences with others, within the educational institution (Burland & Davidson, 2004). If one of these three factors is missing, the transition does not occur, and the student gives up pursuing a music career (*Ibid*). Thus, it seems of paramount importance that higher education institutions encourage the development of consolidated chamber groups, such as duos, to facilitate the acquisition of all these three elements concomitantly. One must agree that two people who choose to share objectives and long-term projects with a common goal, who plan thorough working strategies together, and who have a regular exchange of thoughts about music-making in rehearsals or in common studying sessions, will create a fabric that merges all three factors mentioned above. If, on the contrary, only occasional duos are encouraged at these educational institutions for the purpose of evaluating the abilities of working and playing together between two students, very often the main aim of the involved students in this type of chamber music is to be able to play together without sharing, bonding or growing together in effective and affective communication knowledge.

Moreover, it is possible that, by encouraging the development of a budding consolidated duo early in the musician's nurturing, factors, such as anxiety, that can seriously impair a musician's performance (student or professional) may be avoided or greatly reduced. This is due to the coping strategies that are developed within the group of people who are exposed to exactly the same conditions, in other words, the two students of the future consolidated duo. The promotion of primary groups within educational institutions may in fact impact on individual performance qualities. In order to further explore this idea, the following section will discuss, from a sociological point of view, concepts such as membership, groupship, and leadership.

3.5. Group Identity: membership, groupship and leadership

> *Interpersonal trust is an aspect of close relationship which has been virtually ignored in social scientific research despite its importance as perceived by intimate partners and several family theorists* (Larzelere & Huston, 1980: 595).

In social psychology, a group constituted by two close elements is a dyad. Examples of dyads are mother-son and husband-wife. The uniqueness of such group inter-relationships is their emotional bond. Even if the communication is interrupted for some reason (as in the case of absence of one member, or in the case of a separation because

of a sudden argument) the relationship remains. In a dyad, two people are together because they chose each other due to a common interest: to find the other the missing wanted portrait of the self. This is one of the strongest reasons for the desire of a continuous communication exchange (Gunter, 2008). In such specific group dimensions, there is an interdependent dynamic unit that is influenced by the needs of each member, and this, in turn, is influenced by the needs of the group. Thus, three levels of needs exist in a dyad: 1) individual (membership); 2) group needs (groupship); and 3) balance (leadership).

Membership is the form to recognize how original and unique an individual is within the group. The individual needs that can meet those of the group are connected to the individual self-esteem, identity, security, and the ability to contribute to the group (Maslow, 1998; Bales, 1973). Mediation between the needs of the individual and the group is sometimes necessary in order to serve the needs of the individual members as well as the group. This may be necessary in order to avoid suffocation of the individual by the group. However, individual needs should not be as strong as to destroy the group cohesion. This balance may be acquired by leadership, as it leads to the defence of the group from an excess of individual needs or an excess of "needs" of the group.

The figure of the group leader in membership will be crucial for communication and for making decisions. If the function is clear and the leader is a capable person, the group will successfully achieve the set goals. The climate for such achievement is determined by perceptions (the perception of support, recognition of the roles, openness, and feedback) and the experience of the members who embody the quality of the relationships between/amongst the components. During the process of group dynamics, the role of leadership, which is developed by the demands of the group, is crucial for communication, structure, and assisting with decision making. Sometimes, the leadership might be assumed by the two members of the dyad, as if complementation exists − one will be more capable of emotional decision making, whereas the other takes care of the rational tasks (Bales, 1950). In this situation, the case is of "shared leadership", which may be needed in a duo, resembles "service" as opposed to authoritarian leadership. Shared leadership is less likely to create a dependency of one individual on the other. Rather it is characterized by the negotiation of clear roles for the involvement of all and the possible sharing of both risks and success (Catena, 2004).

The role of a leader in a consolidated duo will be shared according to the individual capacities and the musical situation. Thus, in a consolidated duo one might say that there

are no hierarchical roles. On the contrary, in an occasional instrumental duo, a leader naturally becomes a requisite for the success of the group, at least at a rehearsal level (Duluc & Botteri, 2003; Maroino, 2004). This leader, however, tends to work "with the group" and not "for the group" and has the function of a mediator. Therefore, it should be situational, transparent, flexible, pragmatic, and driven by the task or the relationships (Quaglino, 1992 cited in Catena 2004). When this doesn't happen, regression may occur: the components show attitudes and behaviours of dependence and of "waiting" in relation to the leader, who is considered the only one able to think and to decide (Catena, 2004).

In a duo, "ideal" leadership would result in sharing and even dividing tasks. As a result, a gradual increase of mutual trust and respect will occur, exactly as in a dyad group (Larzelere, & Huston, 1980), thus facilitating the realization of the duo as a unit. The contribution of each member is not only valid but vital to the creative process that can happen. This creative process between two musicians, although not yet measurable, has been more understood through its biologically-involved phenomenology. Fundamental in this context are the pioneering studies of Darwin on emotions of mime communication, as well as the recent studies on mirror neurons discovered by the team of Dr. Giacomo Rizzolatti[6]. In the mirror neuron theory, brain cells are activated when an action is performed for an individual and when this same individual observes the same action performed by another individual. The action must have a goal-oriented significance for the observer. A similar event of activating specific brain areas occurs in the course of an emotion and observing other people within the same emotional state (Wicker *et al*., 2003; Keysers *et al*., Morrison *et al*., 2004; Singer *et al*., 2004 and 2006; Jackson *et al*., 2005 and 2006; Lamm *et al*., 2007).

At this point, a central question to this work emerges: do the anxiety and stress levels of one of the musicians in a duo affect the other? If yes, in which way? Do members of a consolidated group recognise the anxiety of the other? Taking into account the mirror neuron theory, it is highly probably that the answer to these questions are that the

[6] Born in Kiev (b. 1937), Rizzolatti is an Italian neuroscientist. In 1961, he graduated in Medicine at the University of Padua. Since 2002, he is the director of the Department of Neurosciences of the University of Parma. He is the coordinator of the group of scientists who, in 1992, discovered the existence of mirror neurons, which are motor cells of the brain activated during the execution of aimed movements and can explain a physiological basis for many type of behaviour, even empathy.

individual characteristics will be reflected in the group and probably in the quality of the performance itself, as least, from the group's own perception.

In order to better understand group perceptions, and before going further on exploring the pianist's own perspectives of the impact of her own reactions within two different duos (a consolidated and newly formed), interviews were made with three different consolidated duos that encouraged the members to freely provide their perceptions about this matter of the influence of one on the other. The interviews, presented in chapter 5, had as the principal objective to study anxiety and the relationship of the duo members with anxiety.

So, in the following chapter, a literature review concerning various aspects of anxiety will be presented. One of the objectives is to also clarify the differences amongst the terms interchangeably used for anxiety, such as "stress" or "stage fright". As well, the effects produced by anxiety on performance and the extent to which anxiety levels can affect musicians and their interactions or dynamics as a group are included.

CHAPTER 4: STRESS AND PERFORMANCE ANXIETY – A REVIEW

4.STRESS AND MUSIC PERFORMANCE ANXIETY – A REVIEW

4.1. Definitions of Stress and Anxiety in Music Performance

One of the aims of the present work is to understand the psycho-physiological dynamics of a violin-piano duo when performance conditions change, i.e. change in partner in performance, venue, and repertoire. The purpose of such an idea is to understand, from the pianist's point of view, how anxiety and stress of one performer affects the other and, in the case that they do, what are the perceived impacts on the quality of performance. This is extremely important, as a duo will thrive if both members in the group feel that they equally contribute to the collective artistic achievement and to an artistic outcome more effective than the one achieved by playing as a soloist (Goodman, 2008).

If one accepts the definition in which "... a musical *ensemble* is...an unusual kind of social group interaction with modalities which involve a degree of intimacy and subtlety that probably have no equal in any other group" (in Young & Colman, 1979: 12-13), one will inevitably reach the conclusion that any individual discomfort whatsoever − stage fright, anxiety, or stress − will influence the performance of the group. Thus, before exploring the perceptions of consolidated groups on how anxiety, stress, and stage fright are phenomena that affect the group as a whole as well as the individuals in the groups, a brief introduction on understanding what are performance anxiety and performance stress is discussed.

There have been several studies focussing on "stage fright", "anxiety" and "stress" in performance, as these phenomena affect a large number of performers (e.g. Clarke, 1991; Valentine, 2008; Kenny, 2011). Many theoretical frameworks have therefore emerged, including perspectives from areas such as performance studies (e.g. Wolfe, 1989; Kokotsaki, 2007), psychology of music (e.g. Sloboda, 1991 and 2005; Clarke, 2002; Papageorgi, 2007), and education (Kenny, 2011). Also, topics about performing conditions (Brotons, 1994), stress and health (Kenny, 2009b), and many others have emerged. The target population of these studies has included those who practice sport activities (Simon & Martens, 1979); children (Ryan, 2003, 2005); instrumentalists and singers as soloist performers (Kokotsaki & Davidson, 2003); orchestral musicians (Steptoe A. & Fidler, 1987); opera chorus singers (Kenny, Davis & Oates, 2004); other musicians at professional and student levels (Kokotsaki & Davidson, 2003; Wesner, Noyes, & Davis, 1990; Cox & Kenardy, 1993; Tamborrino, 2001; Osborne, Kenny, & Holsombach, 2005;

Fehm & Schmidt, 2005; Kenny, 2006; Kenny, 2011). Results suggest that, independently of the musicians' age, level of expertise, performance preparation and experience, they all share the same necessity of having to find strategies to cope with the impact of MPA.

So far, anxiety in performance has not been extensively researched in chamber music studies. Rather, they have been focused on such topics as rehearsal strategies (Davidson & King, 2004); structure and organization of practise (Ginsborg *et al*., 2006); musician's role in rehearsal (King, 2006); musical co-ordination and non-verbal gestures (Williamon & Davidson, 2002); social interaction (Williamon & Davidson, 2002; Ford & Davidson, 2003; King, 2006); musical interaction and negotiation techniques (Davidson & Good, 2002; Davidson & King, 2004); and modes of communication including visual, gestural, aural, verbal and non-verbal communication (King & Ginsborg, 2011).

Before going further in the literature explaining the impact of the phenomena of "stage fright", "anxiety" and "stress" in the performance, it seems important to present a clarification of the meaning of each of these terms, as in the literature several definitions have been presented.

Some authors use the terms "stress", "stage fright", and "anxiety" interchangeably, whereas others have used them differently. For example, the term "stage fright" and MPA have been used as synonymous in music research and performance (Salmon, 1990; Brodsky, 1996; Papageorgi, Hallam & Welch, 2007), as both situations lead the performer to similar feelings and symptoms (Brandfonbrener, 1999). However, in other fields the term "stage fright" has been considered as a slightly different from anxiety in the performance, being an extreme situation of music performance anxiety for some (Brodsky, 1996; Senyshyn, 1999), and a less severe form of anxiety for others (Fehm and Schmidt, 2005). This lack of agreement in defining each of these terms might be related to the fact that music performance anxiety involves four different intertwined reactions: (i) "the feeling of anxiety, tension, apprehension, dread, panic" (in Kenny, 2011: 49); (ii) a cognition dimension - lack of concentration, forgetfulness, false interpretation of the text; (iii) personal attitudes (technical errors and fears); (iv) and physiological reactions, such as changing in breathing and heart rates, salivation, adrenaline levels and cortisol levels (Steptoe, 2001).

Yet there are authors that differentiate "stage fright" from "musical performance anxiety" because that type of stage fright or fear manifests itself on other areas, whereas MPA only happens to musicians. That type of fear implies a stage presentation in front of

a large audience while musical performance anxiety can occur even in front of two members of a jury. Moreover, stage fright manifests itself as a feeling of fear in a specific moment. Musical performance anxiety can build up over days or weeks before the performance (Kenny, 2011) and is characterized as:

> *the experience of marked and persistent anxious apprehension related to musical performance that has arisen through underlying biological and/or psychological vulnerabilities and/or specific anxiety/conditioning experiences. It is manifested through combinations of affective, cognitive, somatic, and behavioural symptoms. It may occur in a range of performance settings, but is usually more severe in settings involving high ego investment, evaluative threat (audience) and fear of failure. It may be focal (i.e., focused only on music performance), or occur concomitantly with fears of other situations rather than music, such as social phobia. It affects musicians across the lifespan and is at least partially independent of years of training, practice, and level of musical accomplishment. It may or may not impair the quality of the musical performance* (Kenny, 2011: 61).

Also, as different aspects emerge to distinguish terms such as "stage fright" and "anxiety", another distinction can be made with the term "stress". First used by Austrian physiologist source Hans Selye[7] (1907-1982) in 1956 (*The Stress of Life*), the English word "stress" emerged from others coming from Latin and Italian: *strictus* and *stringere*, respectively, and from the medieval French *estrece* (Biondi & Pancheri, 1993). The definition of this term provided by Seyle was the "non-specific response of the body to any demand for change".

Seyle also distinguished between "distress" (negative stress) and "eustress" (positive stress). Negative stress has been explained by Selye as *distress* (from the Latin term *dis* = bad, as in dissonance, disagreement) or the unpleasant feeling of discomfort associated with a waste of energy by stress. By contrast, positive stress or *eustress* (from the Greek term *eu* = good, as in euphony, euphoria) is synonymous with vitality associated to the maximum effectiveness of energy from stress (Giusti & Di Fazio, 2007; Chetta, G. 2008). In other words, stress is positive when it is desired and gives the feeling

[7] The Austrian doctor Hans Selye (1907-1982) was born in Vienna and grew up in Hungary. He became a Doctor of Medicine and Chemistry, practicing in Prague in 1929. The Hungarian language university in that town bears his name. He is remembered for the research done on Stress and the General Adaptation Syndrome (GAS), which he identified and described as the predictable way in which the body restores itself to balance, or homeostasis, in response to stress. The GAS concept offers important applications for designing effective sports training programs, which, in turn, may have possible applications to performing arts.

of dominating one's environment and therefore the vitality grows to the maximum. Conversely, stress is negative when it is unwanted, unpleasant, and accompanied by feelings of insecurity, discomfort, uneasiness, etc. An example of *eustress* would be a job promotion, which assigns more responsibility and is also more rewarding. On the contrary, an unexpected job dismissal, or surgery are examples of *distress,* or situations that cause big emotional and physical disorders that are difficult to resolve.

In other words, stress can be considered as the dynamic relationship between the individual and the environment whose demands exceed the adaptive capacity of the body. The body thus reacts giving a response which increases the likelihood of developing a disease condition (Pereira & Smith, 2006). Typically this stress response is characterized by increased heart rate, increased blood pressure, muscular tension, irritability and depression (Fiamoncini & Fiamoncini, 2003; Everly & Lating, 2013).

Stress can be defined from different perspectives: environmental, psychological and biological (Cassidy, 2002). The environment focuses on environmental events or experiences objectively associated with substantial adaptive requirements such as bus and overcrowded trains, heavy road traffic, exhaust gas owing to the increase of car usage, heavy industrialization near inhabited places, toxic substances' emission from chemical industries, the flowing down of waste water into natural water courses, and others. All these waste elements and many others too have become part of our everyday life during the last century (Mainardi & Saporiti, 1995; van Eck *et al*., 1996). On the other hand, the psychological perspective (Perciavalle, 2005) focuses on the subjective assessments of one's own abilities to cope with requirements derived from specific events or experiences. Finally, the biological perspective focuses on the physiological systems modulated by physical and psychological conditions (Soares & Pereira, 2006).

Negative stress occurs when one or more stressful stimuli produce an increase of hormonal secretions and create a progressive wear on psychophysical defences. In other words, we are faced with a stressful condition when the body reacts disproportionately to external slight stimuli (Gabassi, 2003). So, the body triggers a psycho-biological adaptation process that is characterized, among other changes, by increased secretion of adrenaline, producing various systemic manifestations with physiological and psychological disorders (Margis *et al*., 2003).

So we can arrive at the conclusion that stage fright concerns the artistic or performative environment in front of an audience, while anxiety is concerned with every context of fright as a response to it. Finally, we can consider "stress" as a physiological response derived from anxiety (therefore, from fear). In the present study, the author decided to use, from this moment onward, the term musical performance anxiety (MPA) to define the explored phenomenon.

As one knows, the moment of public (musical) performance is a source of inevitable excitement, tension, and production of emotions (Robazza & Bortoli, 2003): an adaptive biological process (Plutchick, in Izard, 1991) that a person produces in a state of arousal and anxiety in considering himself evaluated. In other words, to play a musical instrument or to speak in public is one of the activities which can produce tension and anxiety (MacIntyre & Renée MacDonald, 1998). In fact, in the process of musical performance, like that of dance, the magic performance lives in the *hic et nunc* (here and now). So, musicians need many capacities, in both psychological and physiological aspects: coordination, synchronization, expressive abilities, fine motor skills and precise timing of actions (Zatorre *et al.,* 2007). To obtain such specific combination of proficiency, a musician needs years of training and solo practice, applying constant self-evaluation and auto-regulation strategies. The combination of all these elements obviously will be developed according to individual characteristics, the performing tasks, and/or the performance situation (Kenny, 2001).

Individual characteristics, tasks to be performed (i.e. repertoire) and situation of the performance (such as performance venue), are all elements that will account for predictions of physical and psychological anxiety symptoms associated with public performances (Wilson & Roland, 2002). In fact, Salmon (1990) argues that occupational stress within the music profession is the perfect reflexion of the risk factors to which musicians are exposed and their effects on physiological symptoms, behaviours, and even the development of cognitive anxiety. Furthermore, during preparation and the actual musical performance itself, the performer can confront technical and interpretative difficulties that, when combined with the above mentioned elements, may give rise to a chaotic performance. This traumatic experience may be so strong as to abandon a career in music (Wilson & Roland, 2002).

However, not all stress in performance can lead to mal-adaptive anxiety. Expectations and desires, among other things, can generate positive events during musical performance. Positive anxiety is known as arousal or activation (Yerkes &

Dodson, 1908). The relationship between stimulus (stress) and performance was solidified into the Yerkes-Dodson Law (1908), which co-relates the increase in performance with the stimulus (stress), physiological and/or mental, in different tasks (from "simple" to "more complex"). In tasks considered "simpler", the level of performance may be higher, whereas in tasks considered "complex" level of performance to be achieved may be lower (compared to the task "simpler"). Yerkes & Dodson concluded that performance reaches its highest level when the stimulus has moderate levels. When the level of stimulation becomes very high, the level of performance tends to decrease appreciably. Both very high and very low stress (or *stimuli*) tend to affect the level of performance in a negative way. In fact, the quality of performance is related to the arousal levels (Wilson, 2002). For example, a low amount of arousal can lead to a boring and lifeless performance. On the contrary, an excessive amount of arousal can cause loss of concentration, memory mistakes, and body and mind instability (*Ibid.*): i.e., when there is much expectation on the part of the participant, the quality of performance can suffer a significant precipitous drop and will be difficult to recover.

Obviously "performance anxiety" is something that is just not bounded to the musical context, since we consider any performance situation in which we act before an audience as potentially hostile and unfamiliar. Numerous studies have been conducted on this topic in sports (Hall *et al*., 1998; Junge, 2000; Hanton, O'Brien & Mellalieu, 2003; Pargman, 2006), and dance (Manley & Wilson, 1980; Hamilton *et al*., 1989; Krasnow *et al.*, 1999; Barrell & Terry, 2003, Adam *et al.*, 2004; Tamborrino, 2001; Walker *et al*., 2010; Čačković, L. *et al.*, 2012). Other studies have been concentrated on anxiety in public speaking or oral presentation (Blote *et al*., 2009; Merritt, Richards, & Davis, 2001) and recitation (Steptoe, 1995; Wilson & Roland, 2002). Interesting studies compared performance anxiety amongst musicians and dancers (Hamilton, 1992); and others looked at stress in actors, dancers, musicians, and singers (Marchant-Haycox & Wilson, 1992). There are also studies (Hamilton & Robson, 2006) seeking to know what knowledge, skills, and values must be considered important in order to improve performance and about the influence of different gender, age, and individual characteristics on performance anxiety (e.g. Papageorgi, 2007).

4.2. Catastrophic performance model

The "catastrophe theory" in performance was developed by the mathematician René Thom to try to describe the effects produced by anxiety while performing various activities (Hardy *et al.,* 2007). The book by Jones & Hardy (1990), *Stress and performance in sport*, conveys an understanding of which ways anxiety or excitement affect performance in competitive sports, and describes the cognitive mechanisms underlying these effects. These authors (*Ibid*.) concluded that a standardized "catastrophic" performance model could be predicted, which is the relationship between cognitive anxiety, increased physiological stress, and their influence on performance.

Thus, we can conclude that excessive cognitive concern associated with an increased level of physiological stress is highly detrimental to the quality of performance. So these findings imply that the interpreter, faced with the limitations and subsequent losses in quality of performance caused by excessive anxiety, must be aware and seek mechanisms or strategies of cognitive and physiological control in order that the performance does not reach catastrophic levels. It is obvious that the same stressful situations may induce completely different responses according to different individuals. This has been referred to as a defensive reaction defined as General Adaptations Syndrome (GAS) by Selye (1950). Dr. Selye noted that the main cause of modern humanity's negative stress is the frustration with the effect of adversities and hassles (problems) of everyday life. For this, a large part of us lives in a situation of protracted stress to which now and then add up episodes of acute stress reaction (as an argument with one's own partner or superiors). Figure 14, explains the three phases of GAS to the stressor elements: Alarm reaction, Resistance, and Exhaustion.

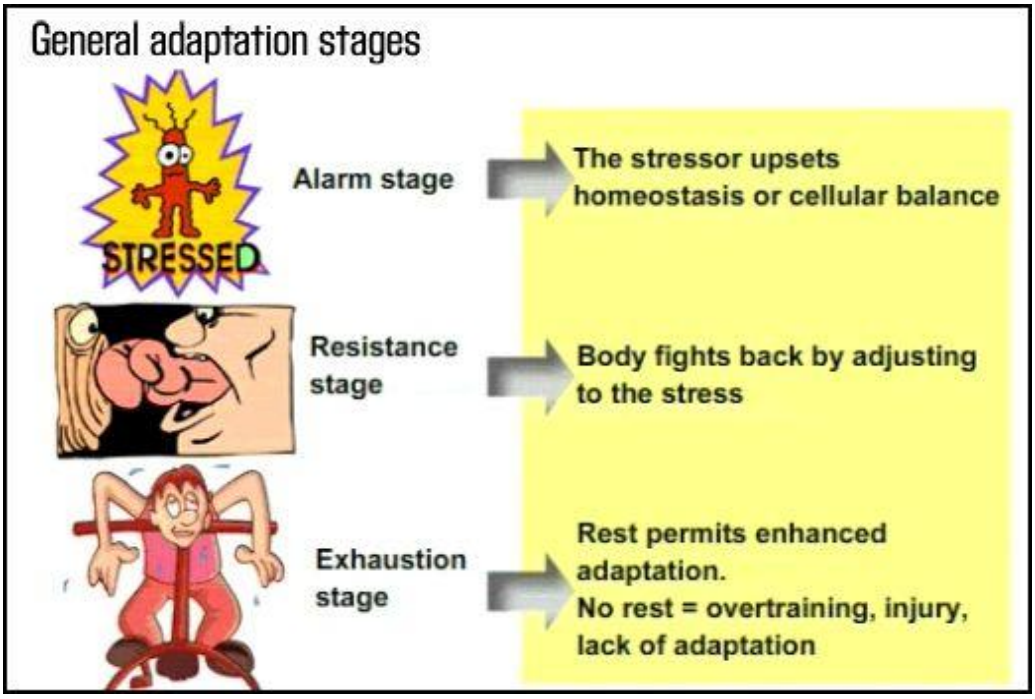


Figure 14. The General Adaptations Syndrome (GAS): Applications for Sports Training. The Figure shows the alarm, resistance and exhaustion stages of stressful situations (adapted from http://duo.sports-training-adviser.com/general-adaptation-syndrome.html#TOP accessed 22th July, 2013: 2 p. m).

►Alarm Reaction

> *When a stressor is activated, a fight/flight reaction is triggered. This is part of the sympathetic branch of the autonomic nervous system (ANS). This stage deals with acute stressors. It is at this stage that the sympathetic adrenal-medullary system (SAM) becomes activated. This is controlled by electrical impulses through nerves, making the response fast. The SAM system involves the hypothalamus sending a message to the adrenal medulla, part of the adrenal gland, to the kidneys. The adrenal medulla then releases adrenaline into the bloodstream, stimulating the body*. (Selye, 1936: 1-3).

►Resistance

That is the most important moment, when the body adapts itself to new circumstances and tries to resist until the stressor element (factor) disappears. The endocrine system helps us to maintain our response, through the hypothalamic pituitary adrenocortical axis (HPA). This is a hormonal response and travels through the blood, making this a slower response.

> *The hypothalamus sends a message to the pituitary gland, which releases adrenocorticotrophic hormone (ACTH). This is what causes the adrenal cortex (part of the adrenal gland) to release cortisol and stimulates the liver to release glucose, thereby suppressing the immune system.* (Selye, 1936: 1-3).

►Exhaustion

> *This stage occurs when the body can no longer keep up with the stressor, and the body's resources have become depleted. It is caused by severe long-term or repeated stress, and it is in this stage that illness is most likely. Once ACTH and cortisol are in the bloodstream the production of more is inhibited. The adrenal glands no longer function properly and they actually increase in size. Blood glucose levels tend to drop, which can result in death. Psycho-physiological disorders may develop, such as hypertension, coronary heart disease (CHD), asthma, and peptic ulcers*. (Selye, 1936: 1-3)

In the case of musical performance the author thinks that, in this context, one can distinguish between the terms "stage fright" and "anxiety", considering the first as a cause and the second as a reaction, in a limited time, to situations that the mind and body recognize as an alarm or danger. More specifically, stage fright is the stimulus that causes anxiety. Physiological and psychological reactions are a response to a specific state at a particular moment that would return to normal once the stimulus, which is perceived as hazardous, ceases. To use the words of neuroscientist Candace Pert (2005, 1999), it is the emotions that unite the mind and body between them. So, when the emotion on stage ends, our body changes again by returning to a "normal" state. "Fear" is a perception that causes a very helpful physiological reaction indeed, because it should allow us to escape or to "activate" before becoming harmed by something that our mind considers dangerous. The anxiety that follows it is the effect of this physiological reaction as increased heart rate and cortisol levels. However, it is not the physiological reaction itself or the perception that caused it. Anxiety therefore is the product of physiological activation of our body caused by fear. To use the words of Epítteto (120 A.D.)[8], "... man is not bothered by the things of life, but by his vision of them".

Therefore, it is evident that there are substantial differences between various people in terms of anxiety. In this respect, it is useful to remember that there are psychology tests that measure Trait anxiety and State anxiety, as the State-Trait Anxiety Inventory by C. D.

[8] http://duo.psicologi-italia.it/psicologia/psicologia-del-benessere/1113/gestire-le-emozioni.html.

Spielberg (b. 1927)[9] (STAI Y1 and Y2 STAI, 1983). They allow measures of levels of trait and state anxiety, before and after "stressful" events. Previous studies showed that these levels differ considerably from person to person.

People who translate stage fright or anxiety into something negative may report symptoms of various types: (i) psychological (doubts about failure and their own self expectations); (ii) physical (such as higher respiration and heart rate, dry mouth, tremors, sweaty palms, etc., as a consequence of a hyperactive sympathetic nervous system); and (iii) behavioural (hyperactivity, rigidity, serious expression) (Valentine, 2008). A facet of pessimistic thinking is the "catastrophe theory" mentioned above, one in which we find ourselves creating dreadful scenarios in our minds. Another variant can be self-handicapping, in which we deliberately create circumstances that may negatively influence the performance. This may include a lack of adequate preparation or a lack of positive behaviours the day before the performance that will result in compromising attitudes and prophecies, which will be realized onstage (Jones & Berglas, 1978). Anyway, when aspects of "stage fright" outweigh the positive aspects to the point that the quality of performance decreases considerably, we are faced with people who need treatment (Spahn, 2006). According to Steptoe & Fidler (1987), while the "stage fright" refers to a normal response to a stressful situation, exaggerated performance "anxiety" is a pathological disorder that requires treatment.

Frequently, one understands that for musicians a state of excitement and anxiety occurs before or during a performance in front of an audience, in a moment in which an important task is being done or which may have an impact on one's self-esteem. It is known that celebrated musicians "including Maria Callas, Enrico Caruso, Pablo Casals, Leopold Godowkskij, Vladimir Horowitz, Ignacy Paderewski and Sergej Rachmaninov, suffered from this syndrome" (Valentine, 2008: 207). Several studies indicate that anxiety is a "serious problem for a large number of musicians" too (Valentine, 2008: 207). The fear of performance is closely related to fear of negative judgment coupled with loss of self-confidence. In fact, this "fear" may be the result of a correlation between the

[9] Charles D. Spielberger (b. 1927) is distinguished research Professor Emeritus and Director of the Centre for Research in Behavioural Medicine and Health Psychology at the University of South Florida. He is a clinical/community psychologist who is well known for his development of the State/Trait Anxiety Inventory (STAI).

identification of self-esteem with the perfection of execution. Often interpreted as something harmful, all musicians know that a minimal amount of exciting *stimuli* is absolutely beneficial for performance. The activity of the sympathetic nervous system acts as positive stimulus by increasing agility and concentration. However, when this brain activity is too intense and uncontrolled, it interferes with performance because the concentration may become weaker, memory lapses may occur, and changes in the firmness of the hands and voice may result (Wilson & Roland, 2002).

Taking into account all of the above findings, the author decided to use in this study the term "music performance anxiety" (MPA) to mean the fear of performance in a musical context caused by many different reasons.

4.3. Causes of MPA

The causes of the development of MPA are found in three principal areas: (i) the personality; (ii) the task; (iii) the context. These three elements interact among themselves. The effect of one depends on one another. Wilson (cited in Valentine, 2008: 214) represented this idea in a three-dimensional concept that shows the three factors that contribute to increase MPA. The more arduous the task, the more anxious the performer seems to be: i.e. when the person increases his/her capacity and skills, he/she will need a more complex task to achieve the same level of anxiety. People differ fundamentally by the response of their involuntary systems and sensitivity, both for the internal excitation typologies and for critical judgment by others. There is evidence that musicians are more anxious than the average population and that orchestral musicians can be more predisposed to anxiety compared to the other artists, such as singers, dancers and actors (Kemp, A. 1981, cited in Valentine, 2008:213).

Abel & Larkin (1990) observed an increase in heart rate, blood pressure, and consciousness of the individual's anxiety in a study when college music students would play in front of a jury. Specifically, males showed more physical signs by a greater increase in blood pressure while females had a more heightened sense of psychological anxiety. As such, it is seen that personality factors, task (concerning the difficulty of a piece), and context interact with them and determine a higher or lower anxiety level. For example, these telling verbal expressions − "My heart beats to the throat", "I can hardly breathe," "The knees are shaking," "My hands are damp and wet," "I cannot think clearly," "I'm disoriented" ; "I feel helpless and abandoned", "They will laugh at me and they will be

right now because ... of course ... I have overestimated myself" − contain all the typical reactions of the altered activities of the sympathetic nervous system that produce an excessive amount of adrenalin, normally triggered in situations of danger or fear and that bring a person to think of "fight or flight?". It is therefore evident that the MPA is a problem for a whole person and cannot be reduced simply to a disorder of motor-control.

One of the possible causes of anxiety is represented by the attitude of perfectionism, i.e., perfectionists spend a lot of energy in the assessment process, develop rigid ideas about what constitutes "success" or "failure", and follow the idea of "all or nothing". Thus, the perfectionist tends to equate a good performance with good self-esteem and *vice versa* (Shafran & Mansell, 2001 cited in Kenny, 2011:74).

Flett & Hewitt (2005) have described three different dimensions of perfectionism related to three different dimensions of anxiety: 1) self-oriented perfectionism (nourished by an excess of expectations); 2) oriented perfectionism by others (to answer the requests from others); 3) the socially prescribed perfectionism (the perception of what others want and ask us).This last dimension is often associated with the fear of negative evaluation, or mental images of an evaluation, or criticism of others. All dimensions of perfectionism are associated differently with pride, shame, guilt, embarrassment and all are associated with self-assessment (Tangney, 2002). According to Kenny (2011: 75):

> *The perception of the external imposition of goals and standards heightens one's sense of uncontrollability and hence anxiety. With respect to music performance, the standards may be imposed, not only by perceived significant others, but by the availability of perfect recordings of the repertoire against which the performer and the audience compare a live concert performance*.

Studies in this direction point out that perfectionism is associated with other personal characteristics (Hall, Kerr, & Matthews, 1998), often associated with other disorders related to social anxiety, although this particular study is inconclusive (Alden, Ryder, & Mellings, 2002).

Another research with classical music professionals by Mor *et al.* (1995), concluded that people who have a high standard of perfectionism, on a social level too, and with little personal control suffered more in terms of anxiety and had less satisfaction with their own performance compared to the people with had less elevated standard in these items.

Other studies were conducted with university music students (Sindem, 1999), with adolescents musicians (Osborne, Kenny & Holsomback, 2005; Stoeber & Eismann, 2007), with opera choir musicians (Kenny, Davis & Oates, 2004) and adult musicians

(Steptoe, 2001; Steptoe & Fidler, 1987). Nevertheless, further studies are required to determine how the influence of family and teachers affect teenagers, as well as studies about the expectations created within oneself. In other words, it seems that the aspect of "pressure from self" is a cause of anxiety among music and dance students and also in orchestral musicians (Kenny, 2011).

4.4. Classification of anxiety disorders and psychological characteristics of musicians who suffer from MPA

Several authors have made studies that led to classification of anxiety disorders and the observation of psychological characteristics of musicians who suffer from performing. According to Stein & Stein (2008) there are three types of anxiety: (i) anxiety resulting from a specific situation; (ii) anxiety resulting from a social anxiety (shyness); (iii) performance anxiety accompanied by depression or panic, usually symptomatic of a wider problem of self-perception and self-esteem. It follows that people more socially anxious are perfectionists and that their idea of high performance standard contributes to self-criticism and social discomfort (Alden, Ryder, & Mellings, 2002 cited in Flett & P. L. Hewitt, 2005).

Studies by Clark & Agras (1991), Cox & Kenardy (1993), Osborne, Kenny & Holsomback (2005), show that musical performance anxiety is associated with other types of anxiety. Thus, MPA is a dynamic process that cannot be regarded as something "apart". It seems clear therefore that some relationship exists amongst social phobia, other anxiety disorders, and MPA (Kenny, 2011). Personality and individual treatment of anxiety are considered as something that determines our response to stress (Creed & Evans, 2002). So, the stage seems only to amplify what we are in real life offstage.

Some theories claim that a different component of anxiety tract may be a psychological heredity but also the result of the wrong support from parents and teachers (Mitchell & Black, 1995; Kenny, 2011) in the initial process of dealing with frustrations and a competitive environment, such as an environment in which young musicians are required to perform too early, thereby creating a sense of inadequacy and instilling a fear to expose themselves (Kenny, 2011).

In a study by Kaspersen & Gotestam (2002), positive and negative feelings were measured in conservatory students. This study showed that anxiety before and during

music performance was clearly associated with elevated levels of negative affectivity. In a study by Bowlby (1982), a necessary condition for healthy development is a safe and predictable relationship with at least one parent, because the familial environment is strongly implicated in the development of the control of emotions and of learning. That is, healthy development depends on the sensitive response from at least one of the parents who can give the child security. Otherwise, the infant will use various behaviours, such as crying or clinging, in order to attain physical closeness of the attached figure (mother, father, or other care giver).

4.5. Symptoms of Anxiety and Performance Studies as part of Chamber Music

According to António Damasio (Damasio, 1999 cited in Altenmüller, 2006:309-310), MPA is a special form of emotional behavior that is characterized by:

- Changing the engine-behaviour, such as voice trembling, irregular breathing, and changes in facial expression.
- A reaction of the autonomic nervous system that manifests palpitations, sweating, flushing, shortness of breath or hyperventilation (wet hands), numbness in fingers, gastrointestinal disorders (dry mouth, loss of appetite, nausea, vomiting), frequent trips to the bathroom, increased urination, diarrhoea, and/or insomnia.
- Subjective sensations, such as feeling tense, feeling vulnerable, increased irritability, depression, anxiety, feelings of abandonment, panic, loss of control, fear, and/ or feelings of inadequacy.
- Cognitive assessment affecting concentration and memory, the ability to make decisions, and/or feeding into the presence of negative thoughts.
- Change in behaviour as insomnia, restless movements, increased talkativeness, or other.

MPA may be manifest in somatic symptoms. The first to explore the relationship between muscular tensions and locked emotions was Wilhelm Reich[10], who, in the thirties, coined the term “armour”. With the term "armour", you are indicating the bio-psychological anchor of emotional repression, or more simply, as the term implies, both physical and mental shield behind which the personality is hides to protect the individual. For Reich, impulses that are not vented out of guilt, shame, or even for impossibility are blocked and become chronic muscular tensions.

Alexander Lowen (1975)[11] has created a practice that can unleash the potential energy of the body. The concept of energy, used in Bioenergetics, includes and unifies the mind, body and emotions in an inseparable totality, as in the oriental tradition (Yoga, Thai Chi Chuan and martial arts).

An interesting book is by Steptoe & Appels (1989) *Stress, personal control and health* in which the aim was “to bring together contributors with diverse perspectives on stress, personal control and health” as well as the article by the same author “Stress, coping and stage fright in professional musicians” that indicates that cognitive and physiological factors are both involved.

Unfortunately still, many musicians and teachers don’t think that the body is the our most precious tool and that it’s extremely important to have a very good physical awareness to better express emotions and feelings during performance. So their attention about the performance persists in repeated mechanical exercises, without an awareness that a rigid body is barely able to live and fully express the intensity of emotions.

As described above, many studies have been conducted on MPA within several contexts. However, very few were made with small chamber music groups, more specifically the instrumental violin-piano duo (at the moment of this study, no specific

[10] Wilhelm Reich (1897-1957) was an Austrian psychiatrist, a student of Sigmund Freud and known for his research on the social role of sexuality.

[11] Alexander Lowen (1910-2008), patient and student of Wilhelm Reich, whom he met in the ‘50s, he is considered the main successor of his approach to psycho-corporeal. In the fifties, after graduating in medicine in Geneva (Switzerland) has developed, initially with John Pierrakos a particular approach known as Bioenergetic Analysis and founded in 1956 in New York, the International Institute for Bioenergetic Analysis, where he was director for forty years.

study realized in this context was found). In the book Musical *Excellence / Strategies and techniques to enhance performance* by Williamon *et al.* (2004) − considered a point of reference for studies like this − the author, after a presentation of practical strategies for improving performance, presents techniques of physical (chapters 9-10), psychological (chapters 11-13) and pharmacological intervention (chapter 14).

Within the category of small chamber music groups some research has been conducted. This includes practice strategies, as well as social-like strategies for creating a bond between or amongst the members of the small group. With the latter, this may include creating an atmosphere of serenity, such as eating together, seems to help group members to feel that they are an important part of the group. To be able to build something that has great value for everyone, it is important that each member is mentally and musically involved in the process so no one can get bored. It is important that each contributes to the growth of the group and that the members of the group must have a personal sense of affiliation, determinant of normative behaviour (Bernhard, Fehr & Fischbacher, 2006).

Studies on the social aspect of rehearsals were performed by Booth (1999, cited in "Strategies for *ensemble* practise" by Davidson & King, in *Musical Excellence* by Williamon), proving a big difference between small professional chamber music groups and amateurs. In general, the rehearsals of the amateurs, although not perfected to performance, show that they enjoy even more the "music-making moment" and the music itself.

Studies were also performed on the approach of rehearsals. It was evident that those groups that had a serious and deep attitude in relation to the study of the score generally had better results in performance. Knowing and discussing the parts of the other components of the *ensemble* proved to be extremely useful (Goodmann, 2000). Special attention is merited regarding the studies on verbal and nonverbal communication among members of small groups of chamber music (Davidson & Good, 2002). They individualized two types of interaction between the players of the string quartets. The first interaction concerned music content and the coordination between them, while the second interaction is connected to the personality and the form of communication (for example, a gesture of approval by the first violin to the second violin for a passage well executed). In the study of Davidson & Good (2002, in *Musical Excellence* by Williamon, 2004) an example reports on the "power struggle" in a string quartet about a situation where "sexual politics" caused by the one male musician was directed to the three females in the group

creating a series of gestures capable of provoking a reaction from the "other" without resorting to the word.

Goodman (2000) analyzed, with regard to verbal and nonverbal communication, a professional piano duo and two duos of cello and piano (who were given the same work to study), checking and comparing the ways to manage rehearsals, looking at how they communicated during rehearsals, and observing their social interaction. To the extent that words were used in order to leave space for glances and smiles, the rehearsals developed successfully, or not, until the performance. It was found that body movements became synchronized and merged with excess gestures reduced in the course of the rehearsals. Thus, it became less necessary to have to communicate with words. (Williamon & Davidson, 2002). All of this, according to the interviews with the pianists, was a result and consequence of the obvious musical coherence sought during rehearsals. The same thing was observed by Davidson & Good (2002) within a string quartet, reaching the conclusion that they could achieve better performance levels (both in entrances as well as in the dynamic expression) if all four musicians "accompany" with the same gestures or movements. The cases presented here simply demonstrate that there is no "best" method or strategy to rehearse the same piece. Each *ensemble* must find its own best way to communicate in order for these rehearsals to be supported and sustained within a solid social context, therefore to work hard during hours and achieve a positive from the socio-emotional standpoint.

To summarize the above, we can say that in some of these works considered here there were studied aspects about rehearsals methods, rehearsal communication, and social interaction, but no reports on MPA in chamber music, specifically in the instrumental violin-piano duo were found.

4.6. Conclusions

From this literature review on stress and anxiety in the performance, the lack of material about levels of anxiety within the small chamber music groups, more exactly in instrumental duo, is evident. Studies completed until now deal with the problem of stage fright, anxiety, and stress performance in many situations but primarily above all in the individual or orchestra area. The research elaborated until now doesn’t show any material concerning MPA within instrumental duo or studies that can report how the individual anxiety may represent a problem for other musicians, in a special chamber music group like a duo. Therefore, in order to better understand the context of the consolidated duo,

the next chapter concerns the consolidated duos' perspectives of anxiety and stress in duo performance, through six interviews conducted with three Duos, internationally recognized and who have played and still have an active career as a duo, as well as two interviews with the violinists of the case study. It is hoped that by doing so to allow for further understanding of the psycho-physiological dynamics emerging within the violin-piano duo of this case study. Within the individual characteristics that affect the quality of the performance itself there may be found anxiety and stress in the performance (Wilson, 2002; Barrick, 2001).

PART II ACTION RESEARCH

CHAPTER 5: STRESS AND PERFORMANCE ANXIETY – A DUO PERSPECTIVE

5. STRESS AND PERFORMANCE ANXIETY – A DUO PERSPECTIVE

5.1. Rationale

To fill in the lack in the literature concerning stress and anxiety in duo performance, face-to-face semi-structured interviews were carried out with experienced instrumental duos. This type of data collection is important as it encourages the interviewees to freely express their opinions towards stress and anxiety in the performance and their impacts on perception of the group, inter-personal dialogue and methods of problem solving.

Qualitative research is undertaken because a problem or issue needs to be explored and because complex and detailed understanding of the subject under discussion is needed (Creswell & Clark, 2007). Qualitative research is also used because quantitative measures and the statistical analysis simply do not answer all questions or do not fit the problem. For Kvale, (2003) the qualitative research interview seeks to describe and the meanings of central themes in the life world of the subjects. The main task in interviewing is to understand the meaning of what the interviewees say. According to Gianturco (2004) qualitative research is based on the importance of studying the facts, actions, norms, values, giving ample space to the point of view or, more generally, to the perspective of those being studied. In other words, we try to look through the eyes of people whom we are studying. And, according to Tanggaard, L. (2009: 1498) one major objective of qualitative research interviewing "…is to identify general discursive repertoires in speaking within particular social settings and to fuel public dialogue about research themes beyond the specific interview setting".

For Lindlof & Taylor (2010: 3)

> *qualitative researchers interview people for several reasons: to understand their perspectives on a scene, to retrieve their experiences from the past to gain expert insight or information, to obtain descriptions of events that are normally unavailable for observation, to foster trust, to understand sensitive relationships, and to create a record of communication that can subsequently be analyzed*.

According to Weiss (2008:11)

> *investigators who are attracted to the richness of materials produced by qualitative interview studies but concerned about what may seem to be their looseness sometimes conclude that fixed- question – open response interviewing provide a desirable compromise. Here respondents are asked carefully crafted questions but are free to answer*

> *them in their own words rather than required simply to choose one or another predetermined alternative*.

Choosing between various types of interview, the author decided to select semi-structured qualitative interviews, because a conversation is induced by the interviewer (in this case, the author) with probing questions of a cognitive type and thus guided by the interviewer through a flexible framework and not through standardized interrogation (Corbetta, 1999: 405).

Each interview lasted approximately forty minutes, during which as much detailed and thorough information on the subject as possible was attempted to retrieve. The primary objectives were to access the perspective of the subjects studied, to try to glean their conceptual perspectives, and to understand their interpretations of their reality and the reasons for their actions / reactions (Burnard, 1991). This is because, until now, no specific interviews on the instrumental duo were found and little is known of this phenomenon under study. Also, we tried to look for new hypotheses and their possible interpretations. MPA is something which, sooner or later, the two people have to confront whether for personal or for reflex reasons. If the people involved in the creative and emotional process are only two it is evident that it will be impossible that the two could not recognize or understand their own potential difficulties or the difficulties of the other.

For this study it was not very easy to find people who belonged to a long-term instrumental duo with substantial activity and who were available to "confess up" and confront an argument that is still considered taboo by many musicians: music performance anxiety. The mere discussion of the topic of MPA became that argument that could admit or prove a hypothetical fragility. In fact, if, on one hand, the empirical material produced from an interview by verbal expression could give us indications about the cognitive and behavioural sphere of the respondent (motivations, opinions, and behaviours) through attitudes, the non-verbal communication, on the other hand, provides indications about the affective and emotional states and their meaning of the respondents.

5.2. Participants and criteria

There were six participants involved in this study, all professional musicians internationally recognized. Among them, all have or had a regular activity in instrumental

duo. These participants included the members of three different instrumental duos, which are characterized as: (i) Violin and piano duo (husband and wife); (ii) Cello and piano duo (two brothers); and (iii) Piano 4-hands duo (husband and wife).

The justification for the selection of the participants depended upon: (i) instrumental duo experience and a high professional level and (ii) willingness to participate. As mentioned above, it was not easy to find duos wanting to participate in a project of this type. This leads us to make a first consideration in relation to the taboo of speaking about the anxiety in stage, even though this topic has been highlighted and studied during the last thirty years and applies to a large part of professional musicians who recognize in MPA, even if they do not publically admit, something that might diminish their image before colleagues or the academic world. Among the three duos, one is now retired from performing due to age. With the other two duos, there is approximately a two-generation difference from the retired one and thus there occurred an interesting and very different perspective given to the same questions.

The participants, in order to protect their anonymity, are identified as the following:

- Duo 1 (D_1). Violin and Piano Duo – Pianist (Francesca), Violinist (Andrea);
- Duo 2 (D_2). Cello and Piano Duo – Pianist (Giovanni), Cellist 4 (Mario);
- Duo 3 (D_3). 4-hands Piano Duo – Pianist (Isabella), Pianist (Rodolfo).

5.3. Interview Study design and procedures

The literature on conducting interviews is very extensive (Jarratt,1996; Wengraf, 2001; Longhurst, 2003; Boni & Quaresma, 2010). The interview cannot be considered a simple technique for gathering information because it is more a process of interaction between two individuals, the interviewer and the interview. To ensure that the interviews were semi-structured and featured by flexibility, there were singled out some general rules for proper conduct of the same. Therefore, a study of the most important guide-lines that pertained to our study was made and which can be summarized in ten points (Corbetta, 1999: 423). These are: 1. Preliminary explanations; 2. Primary questions; 3. Probe questions; 4. Repetition of the question; 5. Repetition of the response; 6. Encouragement, expressions of interest; 7. Pause; 8. Request for further explanation or elaboration; 9. Tactic of theme change; 10. Role of the interviewer.

The qualitative interview proved to be an effective research method for this study because it is open and modelled during the course of the interaction between the interviewer and the interviewees. It is therefore adaptable to different empirical contexts and different personalities. This type of interview left them free to express their opinions and their own attitudes.

In this study, the interview was organized into four blocks of questions (see Appendix 2), preceeded by a brief identification of the respondent. These are described below.

1. The first group of questions was used, in general, to establish a profile of the duo. This included questions to better understand how the duo began, what type of activity and repertoire it had, as well as to find out if any recordings had been made and/or if any new works were dedicated to it.
2. The second group of questions was conducted in order to know if the people involved in the duo had (or have) problems with anxiety on stage and if, along the career they were able to identify situations that normally caused anxiety.
3. The third group of questions was designed to see if there was a "space" inside the duo to talk about the anxiety and, if so, on what terms.
4. Finally, the fourth and final group contained questions related to possible techniques used to solve the problem of anxiety on stage.

In order to carry out the qualitative interviews the following structure was followed:

- Identification of the theoretical framework: what to study and with what expectations;
- Identification of the characteristics of the universe of the subjects (chamber musicians);
- Identification of the individual respondents;
- Definition of the type of interview to be realized;
- Preparation of the interview guideline;
- Unfolding and recording of the interview;
- Transcript of the interview;
- Analyses of all interviews according to key words and phrases;
- Presentation of findings, and discussion of results.

Despite being a common clue to all, with a sort of perimeter between the interviewer and the interviewee who had freedom of movement, the interview could vary and develop according to the answers given by the interviewee and based on individual circumstances. In fact, in some cases, the desire and need to spontaneously develop some argument or some unexpected *nuance* of the argument that was useful to better understanding the subject interviewed sometimes occurred.

5.4. Materials

To carry out the interviews a script of semi-open questions was used. All interviews were recorded and filmed with a SONY video camera (model HDR-CX116), placed in a fixed angle that would be less noticed by the interviewee. There was no separate audio recording made.

5.5. Transcribing the interviews

In order to study more than the verbal context of the interviewee, it was decided to videotape all, after having had the permission of the interviewee. After the interview, a complete *verbatim* (word for word) transcription was made. This transcription kept all comments, exclamations, and pauses intact, because any change would have resulted in a "translation" of the text. Moreover, a system of graphic symbols was developed in order to be able to record the nonverbal conversation. For this purpose, the following abbreviations or symbols were used, according to Corbetta (1999) and Gianturco (2004):

- FF => researcher / interviewer;
- XX => interviewed;
- line space between the two rounds of word;
- ,. ;:! ? => To indicate the intonation;
- [ ] Brackets for adding facial expressions, laughter, etc.;
- ... => hesitation, brief pauses;
- UPPER CASE LETTER => high volume;
- lower case letter => low volume.

Below are two examples of transcription of interviews:

I. MB. NO, ABSOLUTELY NOT. I WAS THERE AND I WAS EXPECTING TO BE CALLED OUT AND WENT TO THE GALLOWS!!! [expression of terror] (Francesca D_1)

II. AS. I can not explain why ... You think how much ruminations we have in the brain, the sensiity… [shakes his head] (Andrea D_1).

5.6. Analysing the data

The analysis of this material, unlike other research techniques, was a task that was not developed in a single moment but as a continuous process. The interviews were analyzed systematically, having been concluded one by one. Later, the interviews were transcribed, translated (having been conducted in Italian), and catalogued with the introduction of symbols that assisted in finding commonalities and differences and in interpreting the content of the text. This type of analysis was corroborated with a professional psychiatrist (FR) who accompanied this study. Once all interviews were completed (six in total) according to this system described above, then they were re-examined as a single group. Whereas the ultimate aim was to understand the reactions of people in relation to MPA, the analyses were focused on the narrow sense of the subject, like a case study, which, in turn, gave the approach a holistic touch. Although the analysis of empirical material is supported by *ad hoc* software such as *NVivo*, *Atlas.ti* and *HyperRsearch* − programs that are part of *Computer Assisted Qualitative Data Analysis Software* (CAQDAS) – it was decided to analyze manually, thereby concentrating on the individual parameters and any common threads, unexpected or unforeseen, which emerged during the interviews.

The presentation of the interviews was conducted in narrative form, i.e. through accounts, episodes, or description of cases, many times using or incorporating the same words used by the interviewees. In this way, an effort was made not to change the collected material or interview guideline so as to convey to the reader the immediacy of the situations presented without forgetting the objectives that were formulated before starting the interviews, obviously, all interlaced with some considerations of the interviewer and afterwards analysed by the psychiatrist who accompanied this research study.

Demazière & Dubar (1997) individuated different types of analysis:

- Analysis of the content;

- Thematic analysis;
- Analysis of the social knowledge of subjects;
- Transparent Analysis;
- Propositional analysis of discourse and relations for the opposition.

According to Demaziere & Dubar (1997) there are three possible attitudes types of analysis. These are:

1 - Illustrative Content analysis (objective description, systematic and quantitative analysis of the concepts expressed by the interviewee) and thematic analysis (splitting the content of the interview themes);

2 - Returning analysis (analysis of the social knowledge of the subjects) and analysis transparent for the understanding of social phenomena (the words are sufficient of the respondents, without the need for interpretation);

3 - Analytical analysis (discourse analysis and reports for opposition, which is based on key concepts of speech and of an overall structure at the base of each speech).

In the first case – the illustrative analysis – the quotations from respondents are used to describe the claims of the researcher. Obviously the risk of this type of analysis is that the interviewer can "transform" citations into an instrument of confirmation of his opinion.

An example of the illustrative analysis is the following:

> *… This may also be an explanation of the difficulty in finding people even today willing to confront and talk about this subject matter because many are worried, considering it a shame. In fact, the first Duo declared not to share among themselves or with other colleagues. This attitude seems to hide a background of generosity by not wanting to be a problem for another*.

So, in the internal illustrative analysis we have the analysis of the content and of the theme.

From thematic analysis we single out and isolate a series of themes and sub-themes forming a scheme within which each interview is "read". Again the risk is that the interviewer can use the material to support a hypothesis or thought according to his/her own inclination. With the attitude of the returning analysis type, the word of the

respondents is considered able to provide alone, in a "transparent" way, the means to understand the phenomena.

An example of returning analysis is from D_3:

> *But in the difficulty I must say that ... alone as I say my difficult times were between 24 and 28 years old, those were very difficult moments. But it was just a problem of identity, I do not know who I was then and have been also lucky because, from a certain point of view, this uneasiness made ''me realize that I had to work on certain things that my relationship with the music was taken much for granted.*

Finally, the analytical attitude makes an analysis of the material by considering prepositions, nouns, pronouns that are considered as semantic units and assumes that they structure the cognitions of the subject.

In this work the author opted to use the type of illustrative analysis (to illustrate) and returning analysis, in the sense to offer, through the words of the interviewed, a returned image of the person. The author tried to isolate statements and common themes and, as closely as possible, "to give back" a useful sense of understanding the problems connected with the fear / anxiety of performance.

5.7. Results and Discussion: The peculiar relationship with stage and anxiety

5.7.1. General considerations

From this analysis of six interviews it emerged clearly that the problem of MPA is something common to all musicians. This fact was evident despite having very many variations of intensity due to the mental attitude and personality of the individual and the circumstances associated. Interestingly enough, in all duo respondents it was also found that one of the duo members always suffered more than the other. In other words, there was always one who had a more complex path or had more difficulty in tackling the problem of anxiety and stage performance.

Also knowing that MPA can have impact on the performance quality, these musicians continue to develop a remarkable career from an international artistic standpoint. In fact, one says that the highly anxious individual does not necessarily demonstrate impaired or inferior performance to that of low anxious individuals (Strahan &

Conger, 1998). Too, we realized that the price to pay sometimes can be really high, taking this remark by the following words that describes one interviewee's feelings in performance:

To play in public is like to walk on thread, without protection, and with wind (Francesca D_1).

In this small study, it is interesting to consider the fact that past history of each duo may have some impact on the level of perception of own anxiety, and especially the way it is looked at. Both musicians of the first interviewed duo (D_1) said they experienced a strong and important passage between the context in which there were only the live concerts and the moment in which there began to emerge recordings, which, despite not having the same perfection as recordings of today, were a mark of strong comparison with the imperfection of the reality of live performances. Therefore, they both spoke of the changing of the idea about "perfection" and of loss of charm that

… once can spring beyond the failed notes… (Andrea D_1)

For D_1 radical changes, concerning MPA, occurred when the performances started having recording or reproducing apparatus, for when there is no playback device only the memory and emotion of the artist will be.

> *When the first recordings began, the comparison [of the takes[gave rise to anxiety... also if at once it* [anxiety] *did not exist the improved listening apparatus became another source of it* [anxiety] *and what was done [the recording], was done. But who listened to it in the concert* [the mistake] *had to put up with it... and what remained were the reminiscences of the artist and the evening... Today, the ear no longer tolerates any wrong notes* (Andrea D_1).

In the case of D_1 there was a kind of passive acceptance of MPA because there was neither knowledge nor techniques to address the problem. In the other duos, they instead noted the fact that the stage became an amplifier of their being. Consequently, in the case of fear that exists, one should direct the fear of the stage (or any other kind of fear) in a way so as to benefit from the experience. This "stage fright", for many, remains a cause of suffering while performing in public.

Concerning this matter, the interviews reveal some very strong and especially touching statements. One of the pianists, a gold medallist at the Royal College of Music in London, who played large solo repertoire and was also devoted to the world of chamber music, in talking about her attitude towards the stage, described it in a clear and exhaustive statement:

> *... although, I repeat, I love music very much, I do not so much love the performance, of being on stage. I do not have a single memory of a concert to be able to say: "ah! How nice, I didn't suffer!" Personally, I do not think I was born to be on stage. So it was always a little unnatural for me, because I had no desire to expose myself. For me, it was waking up in the morning and already feeling something in my stomach ... Although my husband said that I did not seem to be tense* (Francesca D_1).

Similarly, the pianist of the Cello and Piano Duo (D_2), who is self-described as "shy" for many years from adolescence to the early years of the profession, openly declared to have suffered deeply from stage anxiety. This interviewee offered an even more complete view of his inner life and of his attitude of the difficulty with the stage by declaring that he lived in a situation of conflict.

> *Yes, undoubtedly I suffered ... to me, it has always been a relationship of conflict between the pleasure of playing and of suffering…* (Giovanni D_2).

The pianist of the 4-hands Duo (Rodolfo D_3) summed up his position in these words:

> *… I suffered from fears ... with which I had much to fight ... it was always a bit of a fight ... a great fight. The result, we say was not invalidating but for me was, in any way, the result of suffering...* (Rodolfo D_3).

Curiously, these three interviewees had an attitude quite different from the MPA of their partners. This difference leads us to think that each of these three duos found a kind of balance in this sense, i.e. compensation. One of them, a concertmaster of an important Italian orchestra during much of his career, recognized some "small problem" of stage anxiety, but admitted that anyway there wasn't anything that he couldn't control and face.

> *… Of course, yes, a little tension but acceptable, that may be faced ...* (Andrea D_1).

In more or less the same way, the cellist of D_2 showed much more daring compared to his pianist brother in relation to the stage. He said that he never suffered great anxiety, even acknowledging that there could be variations of anxiety related to different situations.

> *I never had major anxieties ... yes, the bow will tremble sometimes but very rarely…* (Mario D_2).

One pianist of the 4-hands Duo (D_3), who had been a child prodigy, never had trouble playing even when an adult. Yet, when she was facing a destructive personal relationship with another musician (pianist) with whom there was a very strong competition, she began experiencing stage fright. In other words, the start of MPA coincided with the time in which her personal identity began to become an issue.

... I started to have problems serious enough from the point of view of stage fright, that was truly difficult times ... but ... today, when we played in duo, never happens to have problems of stage fright (Isabella D_3).

5.7.2. Emergent themes

One of the aspects that have emerged spontaneously in almost all respondents speaking about anxiety/stress in performance was variance of the sensation of anxiety as related to different situations. Virtually all respondents compared the situation of experience of playing "*solo*" with playing chamber music. In other words, all interviewees, spontaneously, without being asked, were found to suffer more in the situations in which they were playing "*solo*" rather in the duo because of the familiarity that developed over the years with their partner, the quality of work of preparation and, not last, because of sharing the stage "together". That is, the fact to be "two" (people), especially for the subjects who suffered more on the stage, the duo itself represented a kind of anchor that gave strength and has served / serves as a life buoy.

... The fear has been halved if compared to having to play the concert of Rachmaninov from memory, just me, or the "Emperor" [Beethoven's 5th piano concerto] *and have him* [her husband] *near me. It was a great sense of comfort, because we were "together"* (Francesca D_1).

... No, never as a child. After, some minor problem. The worst feeling for me is in the solo of the orchestra, not with the duo... (Andrea D_1).

... It is easier for me to play in a duo, very simple… yes, because it's something I've always done [chamber music] *while the solo concert is something that happens rarely ... in duo, I must say, we go more forward, unless I feel [the stress of the stage]; now it's just a joy to come and play. Yes, it's beautiful...* (Mario D_2).

... In the duo I feel safe… when we played in duo I did not ever happen to have problems from stage fright. It sometimes happens to me that I have shaking when I play alone, especially when I had little time to study, yes. But in duo I feel protected (Isabella D_3).

... Generally, my fears were always stronger as a soloist. In all experiments the chamber music was always relaxed but much more quiet with the exception of a few moments of difficulties with people with whom I played or when the repertoire was very challenging, perhaps studied in a short time. So perhaps a bit of stress due to the preparation... (Rodolfo D_3).

Table 1 presents a comparison between the perceptions of MPA when playing *solo* or within a duo. For each duo, it is observable that one member musician suffers (or suffered) more from MPA than the other. Just in one case, notably, one pianist (female) of the 4-hands duo affirms that in duo has no problem with MPA.

Table 1. Respondents' answers concerning MPA, in solo performance situation and in a duo performance situation.

Participants/Duo/ Instrumentalist	MPA in *solo* performance	MPA in duo performance
Francesca (D_1) Violin and Piano Duo – Pianist	Yes	Yes
Andrea (D_1) Violin and Piano Duo – Violinist	Some	Few
Giovanni (D_2) Cello and Piano Duo – Pianist	Yes	Yes
Mario (D_2) Cello and Piano Duo – Cellist	Some	Few
Isabella (D_3)) 4-hands Piano Duo – Pianist	Few (but already had)	No
Rodolfo (D_3) 4-hands Piano Duo – Pianist	Yes	Some

5.7.3. Suffering and Sharing

Bearing in mind that duo performance can be regarded as a privileged environment, it was necessary to know if, within this exclusive environment, there was space to share the problem of anxiety on stage between duo members. When looking at the responses concerned the "sharing" of MPA experiences or talking about this problem with the partner and / or other colleagues, the results revealed that there was a substantial difference between the attitude of the first duo - the oldest and, therefore, the one that does not have active performance at the moment - and the other two duos. For this older duo, it was "normal" to suffer on stage. It was a perfectly natural reaction and this was almost a price to pay for being on stage. One "should" suffer for one's Art.

> *No, I didn't speak ... I thought "it is so, I do this work and it is so"* (Francesca D_1).

This attitude was spoken of as if this was, indeed, an element of discrimination and selection of nature. In other words, the musician who couldn't withstand the pressure of the stage had not enough talent and was therefore automatically "eliminated". So, there was an association between stage fright and a kind of weakness. This may also be an explanation of the difficulty in finding duos willing to talk about MPA; many still deal with the shame of having it. In fact, the first duo declared not to share among themselves or with other colleagues their stage fears. This attitude seems to hide a background of generosity by not wanting to be a problem for the other, in this case, the partner in performance.

> *… There were times in which there was no talk of these things... no, I did not want to talk to him* [the husband] *about my stage fright, because I thought that he had his problems too* (Francesca D_1).

Thus, the problem remains in each performer, despite performing together, although in very different forms and intensities, throughout their entire career. In fact, the pianist never remembered a concert in which she had not suffered. But also this attitude did not allow her to know if her husband suffered from stage fright and to what extent, despite being husband and wife.

> *... I do not think my husband suffered less. But I'm not sure because he never hinted* (Francesca D_1).

Interesting is the position of her husband (the violinist of D_1), who claims, on the contrary, to suffer a little from anxiety, but it was nothing that he could control or face. It also seems to be an interesting statement in which he acknowledges that, in any way, especially in the role of first violin of an orchestra, he must maintain a strong image.

> *I ... couldn't let me go ...* (Andrea D_1).

Regarding the other four interviews, it is important to remember that all are within a similar age group, younger than D_1. In D_1, MPA was recognized and lived closely but not shared nor within the duo and even less with colleagues. In the other duos, the problem of MPA, although with some significant variables, was treated and eventually solved. The attitude of sharing happened to everyone in D_2 and D_3 and almost exclusively within the familiarity of the duo and very rarely with colleagues in whom they found a lot of refractoriness in talking about it and even difficulty in admitting the existence of this fear because of the stigma of shame associated with MPA.

In the 4-hands Piano Duo (D_3), there was a rare case of complete sharing within duo members. This was owing to the particular individual path taken.

> *... Is a theme that is part of our history: so it would be a contradiction to have the embarrassment of talking about it* (Rodolfo D_3).

> *… We are very close ... so if there are concerns we always share them* (Isabella D_3).

The D_3 was founded after many years of friendship and the realization of a common project: the creation of a Music Academy in which they found space and have integrated wisdom and empirical knowledge of ancient traditions such as Yoga, meditation techniques, breathing and disciplines more modern like Neuro-Lingistic Programming (NLP), Feldenkrais or Alexander techniques, Mind-mapping etc... Only after that, in fact, was formed the instrumental duo. After a few years, their relationship turned into something privileged, intimate, and lasting, culminating in marriage and thus not only in a

musical-professional relationship. It seems obvious that, for them, facing this kind of MPA issue is part of their personal lives.

In relation to speaking with the others colleagues, about MPA, a different kind of attitude was detected. This difference can probably be explained by the fact of the physical nature of their instruments: breath control, and air flow (singers and wind players).

So, Rodolfo and Isabel (D_3) say:

> *... with some people yes* [to speak about MPA], *I do, and with others no, because they are completely refractory to this thing, especially the violinists. Because even with the singer, in this aspect there is much looseness ... probably because where there have to do with consciously breathing is simpler, because the breath in itself is one of the most important keys for me ...* (Rodolfo D_3).

> *... Is already a lot when someone can admit being afraid ...* (Isabella D_3).

With some variations, in the Cello and Piano Duo, D_2, there is an opening towards the other, but in a less direct way and only within the family as

> *... until I was in the school it was easy for me to confront myself with my friends / classmates ... but when I crossed the threshold of the profession, to share the problems put you a little bare, I found it to be much, much harder* (Giovanni D_2).

However, within the family, which consists of many brothers who are all musicians, the pianist managed to find a valve sharing especially with one brother that is not, curiously, the cellist partner, but another brother:

> *... he is one that has undergone the stage further than me* (Giovanni D_2).

The cellist of D_2, however, has a different attitude. He goes a little further and thinks that once one has always known his brother and shared so much with him that everything that is exactly happening to him is known and understood and, as such, it is not necessary to verbalize much.

> *… We do not talk so often because there is not this need* (Mario D_2).

While, the pianist affirmed that his brother

> *in general* [he] *always suffered less from me ...* (Giovanni D_2).

Also, he proved to be aware and to able to recognize their levels of anxiety as he felt the differences experienced in performing with his brother. These levels were transformed

and experienced as something positive. In other words, with the support of his brother who could offer security, he said:

> *... This aspect helped me with it* [MPA] ... *playing predominantly with him it facilitated me in addressing the audience and the stage* (Giovanni D_2).

The cellist brother affirmed his conviction for whom it's important to help others with their own peacefulness:

> *… In my opinion is the example, is something that is done naturally and therefore during the moments in which you offer a bit of your tranquillity to the other, the other calms down* (Mario D_2).

To resume, the responses of the six interviewees were quite different. Basically, three positions relative to this question are found in the duos' responses: 1) a position of concern for the other; 2) a more positive attitude by trying to be as quiet or reticent as possible about MPA, convinced that this attitude is helpful to the partner in performance; and 3) a position of acceptance of the other's difference. The concern for the other, evidences a desire that things can go well for the other person, considered to be a bit more fragile emotionally, because the experience of this performance is rewarding and satisfying and because the performance can reward the efforts and sacrifices done to get there. The reaction to become quieter in front of the other's anxiety expresses the acceptance of the other's differences and the wish to help the other with the most serene posture.

> *… Not solve much talking about trying to help someone else with their own tranquillity* (Mario D_2).

> *… When these moments happen my reaction is rather to try to calm me more. Paradoxically, for me the other people's tension calms me* (Rodolfo D_3).

Yet, in this case Rodolfo (D_3) doesn't speak about the consolidated duo but about the collaborations that are more or less occasional, albeit with some regularity. The person who cares about the other is concerned with the fact that the person who is suffering can overcome the obstacles and can therefore achieve his/her desired quality performance. In other words, the wish is that the experience of performance is positive and that it has positive repercussions on his/her self esteem.

In Table 2 one can see clearly the different opinions of the interviewers on the importance of sharing MPA with the partner in performance and with other musician colleagues. It seems evident that is not easy to speak with other colleagues about MPA and that the position with the own partner is quite wide, from no sharing to totally sharing.

Table 2. Capacity and will to share MPA experiences with own partner and other musician colleagues.

Participants/Duo/Instrumentalist	Sharing (MPA) within Duo	Sharing (MPA) with other colleagues
Francesca (D_1) Violin and Piano Duo – Pianist	No	No
Andrea (D_1) Violin and Piano Duo – Violinist	No	No
Giovanni (D_2) Cello and Piano Duo – Pianist	Rarely	No
Mario (D_2) Cello and Piano Duo – Cellist	Rarely	No
Isabella (D_3)) 4-hands Piano Duo – Pianist	Yes	Yes (but others are not always available)
Rodolfo (D_3) 4-hands Piano Duo – Pianist	Yes	Yes (but others are not always available)

5.7.4. The possible causes of anxiety and stage performance

Another important aspect asked about MPA was possible associated causes. Maybe one primary consideration would be to clarify whether by "causes" it is implicit from where our fears come. Probably the possibilities are infinite because one can discuss from childhood until what the performer eats on the day of the concert, or the individual relationship with music, emotions, judgment by other, comparison with others, the balance and energy of the body and other possible causes. So, to organise this endless palette of causes in a general scheme becomes an extremely difficult task. Thus, maybe it would be more constructive to try to understand the inner dynamics, the way in which a person thinks, feels, behaves, and acts in public. As the pianist of the 4-hands Duo recalls, NLP teaches us that people create movies in their heads that lead to fear, because they obey the automatic schemes learned. So, the most important thing is to learn to recognize these problems and then to change them, since this involves a good deal of self-consciousness and self-observation.

> *One could say that the true cause of fear is lack of self - knowledge and how the mind works, an ignorance of the creative mechanisms of perception and attention* (Rodolfo D_3).

It could be interesting, in this aspect, trying to think of a meaning that Aristotle gave to the principle of "cause", which is not only the "because" − the origin of something but also its purpose – in other words, the reason that the cause happens (Todorov, 1979). Thus, "stage fright" or "performance anxiety" could be seen as a signal that has one of its object and purpose.

It could be more useful to ask ourselves what we do with fear, how each one interacts with its sensations and experiences instead of asking ourselves how we can transform it. Obviously, this is a deeply personal journey that cannot be generalized. Therefore, fear might be related to the way and the ability with which each one manages him/herself. For the pianist of the 4-hands duo, this management can be that the musician looks for an experience in music, something of which he isn't always conscious. In that sense, a musician is looking for something that can transcend oneself, but since he is not very aware, he comes into conflict with himself.

> *Fear ... is fear that others are unaware of what we can be* (Rodolfo D_3).

But it is clear that this is an attachment to a picture of oneself that:

> *… prevents the flow that it is necessary to live music, to play it ...* (Rodolfo D_3).

According to his colleague, the fear of performance, based on personal experience as a teacher, depends in 80-85% of cases, of two factors:

> *the first due to a poorly done study and the second to an inability to manage physically* (Isabella D_3).

For her, the problem also lies in the fact to be isolated, to carve out a space to live alone. And so the fault would be shifting the goal that was just the fact of making music and transmitting values. She believes that many people, especially among young people, are afraid to perform because they are

> *… much more important than the music. The good impression in front of others is much more important than what they are playing* (Isabella D_3).

Other reasons may be an inability to predict in the study or learning phase what will happen during performance, or to rely upon muscle memory without thinking that during the performance levels of attention, concentration, breathing change, and/or other factors can interfere or betray the muscle memory. Based on her personal experience as a teacher and pianist she says:

> *I notice that often ... who is very anxious not fixed physical positive sensations, doesn't nourish the well-being with attention and therefore isn't able to reproduce it* (Isabella D_3).

Anxiety develops because things are run differently than usual when we are at home and we don't know how to manage this change. It is clear that a bad management of one's own body includes incorrect physical attitudes, locked or overly protected muscles or muscular tension (for example, locked or raised shoulders; lifting your shoulders for tension in the legs or the neck muscles; or simply holding your breath). Unfortunately,

there are few examples of teaching based on proprioception, or self-knowledge. In other words, it could be more useful to decide how we feel and act by using effective strategies for doing so. That is, to learn that the difference is to understand that:

> *... I can decide how I feel, the place to consider myself a victim of something stronger and powerful to me* (Isabella D_3).

As for the aspect of possible interference and family to influence the development of our fears, it may be questioned when we observe that, in the case of the duo of brothers, we have two very different reactions although they grow in the same environment, with only four years apart, and have the same parents. This shows that environment has not prevented a very different attitude towards performance. This may indicate that probably the personality characteristics of everyone and, especially, the way in which we decided to relate to the problems will have a fundamental weight in the development and attitude of performance anxiety.

In Table 3, there is a summary of the opinion about possible causes of anxiety. Independently of the age all participants interviewed think that bad preparation, judgment of the other, lack of musical beliefs and the personality characteristics are the strongest reason to develop or to nourish MPA.

Table 3. The summary shows the thought of the interviewed about possible causes of MPA. Only in the management of body, the youngest duo didn't mentioned about it.

Participants/Duo/Instrumentalist	Opinion on the possible causes of anxiety				
	Lack of preparation	Judgment of the other	Management's own body	Lack of musical beliefs	Personality
Francesca (D_1) Violin and Piano Duo - Pianist	X	X	-	X	X
Andrea (D_1) Violin and Piano Duo – Violinist	X	X	-	X	X
Giovanni (D_2) Cello and Piano Duo – Pianist	X	X	X	X	X
Mario (D_2) Cello and Piano Duo – Cellist	X	X	X	X	X
Isabella (D_3)) 4-hands Piano Duo – Pianist	X	X	X	X	X
Rodolfo (D_3) 4-hands Piano Duo – Pianist	X	X	X	X	X

5.7.5. Attempts to solve the problem

In the analyses of the six interviews there emerged the fact that attempts to solve the problem of MPA were several, with the exception of the first respondent Duo (Violin and Piano Duo) who did not attempt to solve the problem and did not acknowledge to the

other its existence: they simply thought they should live with it and try to accept what this suffering was. It was convincing that this was “normal” and that suffering was part of this activity. Even so, despite this position, almost "passive acceptance", this duo considers that there are four elements in order to overcome anxiety when it may be a risk factor of jeopardising the quality of the performance: (i) being well prepared; (ii) knowing each other well; (iii) having support from each other; (iv) making a loving search for excellence.

To summarize, it would be of great help to have confidence in their preparation, be aware that they were doing a good job, have good knowledge of their partner and to know that unconditional support can be counted on, to have a loving musical search in the phase of preparation and to look for something to convey together to an audience. This conviction, shared by others who also put the quality of the study before the performance in the first place and claim that the great work during the preparation of performance and the fact to have very clear ideas about what they are playing, is something that represents an element of strength to avoid maladaptive anxiety.

> *I must say that the great job that we do and the fact that we have very clear ideas about what we're playing, being very convinced of what is being proposed is for me / us extremely important ...* (Mario D_2).

While one of the pianists of the 4-hands duo, for many years, was trying to cope with MPA admitted that there was not much space, or any, to create a kind of "free" performance "in the moment", summarizing in these words:

> *… I must to put beside anxiety and created, in any way, a kind of execution that was standardized and could, in any case, operate and represented me.... yes it was hard to surrender to the moment... I was always studying a lot ... to create a preparation so strong that I could play in public a type of performance that corresponded to me* (Rodolfo D_3).

The common opinion of respondents is also the fact that if, on one side it is found that probably the fear never disappears completely, it can undoubtedly be addressed consciously and constructively. MPA, then, can become

> *… a thrill to turn and not eliminate* (Giovanni D_2).

In addition to this attitude, the Cello and Piano Duo practices Yoga daily and for many years (from the early '80s) and believes that it helps their physical, mental, and emotional control enormously at the moment of entering the stage. The pianist also said that for some time, because of being too overwhelmed with multiple tasks in various directions as a pianist, teacher, concert organizer, etc., he decided to eliminate this daily

practice of Yoga. However, he admitted, "it was wrong", because the situation began to get out of control again. So, he decided to resume the practice of Yoga and also include daily meditation, because for both musicians this life habit is something extremely important.

One member of this duo also believes that:

> *… the experience of teaching, anyway, facilitates ... to understand the problem from different points of view and therefore to understand that one can make a route that can be followed forward, one which can solve* (Giovanni D_2).

In the case of the pianists' duo, to use the words of one of them, it is found that:

> *... If you work on yourself you let go of too much of your ego, you let go of your image all too well and then, consequently, it becomes very easy* (Isabella D_3).

Thus, the viewpoint of having too little ego creates a situation of a passive victimization. If there is too much ego, then the situation becomes an excessive narcissism, which can also be destroyed by the judgment of others. The ideal situation is a viewpoint in which introspection, self analysis, research, and recognition of emotions are recognized to be fundamental in addressing the problem of anxiety and, over time, in finding a solution.

The 4-hands Piano duo, which also passed through different experiences on a personal level through work in the Avatar Course using techniques of active imagination, relaxation, etc., (the most "powerful" course, to use the words of the female pianist), affirms that to work on one's self is an experience in which one feels

> *… that there is a transformation between before and after* (Isabella D_3)

and has changed very much the lives of both just because this course provided them with the tools to manage the focus of energy and attention. These tools have been important also in their work as teachers, to help students to find their capacities to improve the relationship with one's own body.

> *… I realized how important it was to have a focused study, to be in touch with your body in a certain way ... my relationship with music has really become a relationship of great pleasure* (Isabella D_3).

For the pianist thus becomes extremely important fifteen / twenty minutes of mental preparation before the concert, or whatever a person does in those moments before going on stage. Especially, she thinks that the "presence of mind" is a very significant and

important factor because the mind is entangled in disabling images. And this translates into something mental and physical welfare, a kind of physical preparation

> *because I should feel good physically ... and certainly I don't stay stopped on a chair ...* (Isabella D_3).

Table 4 presents a summary of the above mentioned techniques used by the participants to cope with MPA.

Table 4. The first duo (the less young duo) didn't use any technique to overcome MPA. On the contrary, the two younger duos are open to speak, share and experiment different techniques trying to solve the problem.

Participants/Duo/ Instrumentalist	Techniques used to tackle stage fright			
	Yoga	Avatar	Meditation	Others (Feldenkreis/ Alexandre/etc.)
Francesca (D_1) Violin and Piano Duo - Pianist	-	-	-	-
Andrea (D_1) Violin and Piano Duo – Violinist	-	-	-	-
Giovanni (D_2) Cello and Piano Duo – Pianist	X	-	X	-
Mario (D_2) Cello and Piano Duo – Cellist	X	-	X	-
Isabella (D_3)) 4-hands Piano Duo – Pianist	-	X	X	X
Rodolfo (D_3) 4-hands Piano Duo – Pianist	-	X	X	X

5.7.6. MPA differences between consolidated and occasional duos

Another important aspect that was highlighted in almost every interview, and spontaneously, was the difference of MPA levels between the consolidate duo and occasional duo. In the case of older Duo (D_1), the pianist said:

> *... it is surely beautiful to be a duo and also be a family. No doubt ... I think that is GREAT thing ... For us, the word duo means many things. It means a great harmony, as well as two individual people. We are still here to live the same things, to look at a good film and cry at the same things... and we are always so much music lovers* (Francesca D_1).

Even the more radical violinist husband said:

> *The duo as a hierarchical structure makes no sense: the duo is only such when it's just family. The duo should be a loving pair who loves and creates a fluid at the moment ... stays close and no one can play like you* (Andrea D_1).

In the same way, another interviewee puts the accent on the difference between playing with one's partner and playing more or less frequently with other people:

> *There are synergies that create a unit of different things with different people with whom you to dealing with* (Rodolfo D_3).

The same opinion was shared by the cellist who is happy to be still rehearsing (a phase he considers to be even more beautiful than the performance itself) with his brother with whom he has the privilege of having shared thirty years of concerts, from an early age, aware that this is something extremely rare:

> *… when we played together ... there is another air onstage compared to when we did a concert with another person ...* (Mario D_2).

In this regard, this opinion is almost always shared by the musicians who make chamber music like a philosophy of life based on sharing and complementarity. Remembering a wonderful affirmation of violinist Elisa Pegreffi (the second violin of the famous *Quartetto Italiano*), when during an interview, told that somebody once said to them that there was another quartet which, contrary to them (they used to spend the entire day rehearsing together), made few rehearsals and performed in public just the same. She merely smiled and said:

> *Well… listen to it!* (Pegreffi)[12].

With that stated, it is clear that occasional chamber music with non-regular partners has nothing to do with groups working together for a long time. The fact is that only people who make a career of this kind may be able to recognize a group that works in a certain way. Otherwise, to the contrary, the musicians who do not perform in stable or consolidated groups will not be able to notice the difference.

As well, the pianist of the 4-hands Duo, which considers itself privileged to be able to share music also as couple and in it finds something beautiful and wonderful, thinks that in the Duo she feels safe. She declares that their duo is:

> *a journey, a challenge ... we never stop, it is a continuous challenge ... and… the goal is not only to be good with the music and propose the music of the heart; it is also releasing in the*

[12] Elisa Pegreffi was the second violin of *Quartetto Italiano*, a famous string quartet founded in 1945. They made their debut in 1945 at Carpi when all four players were still in their early 20's. They were originally named *Nuovo Quartetto Italiano* before dropping the "Nuovo" in 1951. They are particularly noted for their sound, their recording of the complete cycle of Beethoven string quartets - made between 1967 and 1975 - and for their playing by memory.

> *environment a little bit of clean air ... because we have to understand that a musician today in society is a tremendous resource* (Isabella D_3).

To empower and to be able to communicate at a much deeper level, emotionally, to find a more intimate contact, to help the person to open up, to look to their own resources with confidence, is undoubtedly something positive to offer to our society, which needs that very much. And this sharing, as stated by the partner, represents the point of the duo's strength. Thus, this duo is sharing on many levels, not only musical. They clearly are aware:

> *that music and life are not two separate realities ...* (Rodolfo D_3).

Thus, in this aspect, the fact of sharing a life on a personal level creates a kind of advantage. The pianist (male) says the same:

> *I think it is not so simple for many others because if you do not make music a survey of life ... then communication becomes a little different ... because it communicates on different levels* (Rodolfo D_3).

That (level of communication) is shallower. So when he plays with his usual pianist partner he declares to have a sense of "harmony and fullness" while with others he sometimes feels "a difficulty" but can also feel "moments of challenge, moments of very strong stimulus." The big difference between the stable Duo and the other is synthesized in this sentence:

> *When I play with her ... I feel at home ...* (Rodolfo D_3).

5.8. Final considerations

From the analysis of these six interviews one may say that MPA is something common to all musicians. For these interviewed musicians, chamber music, especially performing in a duo, is a refuge, a safe place where they feel protected. They found that the highest tension in relation to the stage fright occurs in two occasions: (i) performing *solo* and (ii) under-preparing, or, for whatever reason, the preparation has not been suitable or was considered to be insufficient.

Regarding the causes of MPA in duo performance, the family and the context in which the musician has grown up have a strong impact on the degree of experiencing more or less anxiety about public performance. As well, personal characteristics have a large impact on the development and degree of MPA. As observed from the duo of the

two brothers from the same family, very different reactions about performance and anxiety existed despite growing up in the same environment. Therefore, we can deduce that a sensitive and carefully observant attitude on the part of those who deal with the process of growth and the development of young musicians − be they family members and/or pupils − can help them to make the personal journey in a way that is the most suitable to the individual characteristics.

There also emerged from the interviews the lack of an education system that promotes knowledge and the development of coping strategies to deal with MPA. This need is regarded as urgent as this kind of education can help a person to search inwardly about not only about the causes but especially about the possibilities to be able to control and manage somatic and psychological reactions.

So in all of this, it is not explained, for example, why for decades we are accustomed to the fact that it is imperative for a professional sportsman to have a personal trainer who accompanies him/her almost every day, as well as a massage therapist and a psychologist to help him/her organize and analyse his/her options and to manage his/her emotions, whereas a musician, who also must deal with his/her own body and enormous emotions, is left alone and abandoned and confined to his/her space. It is up to the musician's personal initiative to decide a path of analysis and insights, absent of any guidance.

In this respect, it would be desirable in the course of musical learning and training that there would be much more attention to the self-awareness of one's own body and emotions, and, not least, to the quality of lifestyle, diet included. Considering the claims of the respondents, these elements would represent a positive result in the quality of their own life experience in relation to the stage and performance. At the strictly personal level, more confidence and self-awareness would be possible by overcoming these impediments.

Regarding the attempts to solve the problem of MPA, we find here many agreements among all respondents about the fact that an appropriate study, done in a rational and conscious way along with a positive psycho-somatic attitude and a healthy lifestyle and the application of breathing techniques and concentration, are actually effective means to counter the problems of performance anxiety. The same duo who has never tried a technique (because at the time "there was no talk minimally" of these problems) and passively accepted this suffering (D_1) recognized that being well prepared,

knowing well, considering the other to be secure, and having made a loving study of the content are sure-fire weapons to counter the anxiety of performance.

Personally, the author believes that the teacher's attitude towards this aspect is crucial. When the teacher or the "*Maestro*" is seen as our guide − not only musical but spiritual − and we have great admiration for him/her, the message that the teacher can pass to us becomes crucial in our experiences with, and before, the performance. Relatively speaking, the moment that is, after all, only a moment of our lives is one of the steps. Another is to learn to know one's body and the somatic own reactions in order to be able to learn to control them and manage them. However, this rarely is taught or discussed in an educational path.

Often teachers, who may have been frustrated with their career options, stopped playing or left a career because of MPA. Or, in the odd case, they may be people who have not suffered much on the stage and therefore have never confronted this problem and are not able to turn to help others.

Regarding the perception of "difference" between the consolidated duo compared to occasional duos, all are agreed that in fact there is, on stage, a "different air" when one has played for a long time with a person and has developed a special relationship, like husband and wife or as brothers as

> two people who know each other, know how to breathe, know the defects, etc.. able to achieve an special amalgamation becomes a unique personality (Andrea D_1).

As an interviewee observed in the comparison of the occasional duo to the consolidated duo (the former of which may consist of two great soloists who are occasionally together),

> there isn't poetry, or charm" (Andrea D_1).

This interviewee belongs to a duo that has worked for a long time with love to the search for the details to make a performance to become something special and privileged where communication between the two is based on a series of thoughts, opinions and details that have been chosen, reflected and matured over time. Wrongly, according to respondents, we think that anything that "is made in two is turned in a duo" (Andrea D_1).

In this context, the aspect of "sharing" is seen as something extremely important for development not only as musicians but also as human beings. The scheme "*divide et impera*", in which everyone stays in their own small corners, is a safer path than the

contrasted one of opening up to change. The former presents the loss of opportunity to evolve and therefore nurture "our fears", as stated by the pianist of the 4-hands Duo. In this aspect, the author would open a small parenthesis emphasizing that the opportunity of "sharing", which chamber music offers, is, without comparison, undoubtedly a special and wonderful land, a plot to which more space within (and outside) the training of musicians should be given, if we acknowledge music the extremely powerful features of social value that belongs to it.

Following, as a complement to the interviews, selected multi-disciplinary qualitative and quantitative studies are presented. These include various standardized psychological tests to assess the personality, anxiety, and self-concept, as well as the physiological tests to measure the levels of cortisol (a stress hormone), and heart rate monitoring during performance. Furthermore, a test of auditory perception by outside listeners was submitted to various professional musicians that included examples from the experimental concerts. These tests are presented in the following chapter and will conclude Part II of the thesis.

CHAPTER 6: PSYCHO-PHYSIOLOGICAL MARKERS IN DUO PERFORMANCE

6. PSYCHO-PHYSIOLOGICAL MARKERS IN DUO PERFORMANCE

6.1. The rationale

As suggested by the results of the interviews, it seems that performance anxiety exists and is a phenomenon that can affect the duo dynamics. Musicians develop, through their career as a duo, different coping strategies in order to take advantage of that anxiety for the benefit of the performance. However, the interviews concerned only the perspectives of consolidated instrumental duos, i.e. which have a life-experience career playing together. As discussed in the first part of this thesis, this long-lasting relation within the context of a social-working group is not always promoted during the years of education of a music that might develop a career as a chamber musician. Moreover, pianists nowadays assume the role of "accompanists" in educational institutions. Thus, it seems important to discuss, from the point of view of the pianist author of this thesis, the impacts of changing partner in performance. As anxiety and stress related to the performance also change according to other factors, such as changing repertoire and venue, these elements were also taken into account as additional variables. Thus, this chapter presents a case study on comparing a consolidated and a newly formed violin-piano duo's psycho-physiological reactions during two different performance conditions (i.e. changing venue and repertoire), centring the observations on the pianist, the common element in both duos. Observations will be done in two levels: quantitative and qualitative of psychological and physiological dimensions. These methodological approaches (i.e. of combining different forms of data collection and analysis), contributes to the profound understanding of human behaviour (Polit & Beck, 2010). In fact, case study reports are a common methodological approach in studying music performance, due to the idiosyncratic nature of this human activity (Robson, 2002).

The case study here presented is only of an exploratory nature, as no previous studies were found to guide the researcher.

6.2. Participants and recruitment

Two violin-piano duos were studied: (i) a consolidated one (CDuo), constituted by the author of this thesis, a pianist (P) and a violinist (V_1), who have worked together for more than fourteen years as a duo; (ii) a newly formed duo (ODuo), constituted by the

same pianist (the author) and a violinist that joined the duo for the purposes of this investigation (V_2). These two duos were matched for health conditions, age and performing experience. The violinist of the newly formed duo was a violin teacher at the University where this work has been developed, for more than fifteen years, who volunteered to participate.

6.3. Overall Study design, materials and procedures of the Case Study

From several methodological approaches described in the literature, action research was the most appropriate one for the study for several reasons. The first is related to the fact that the pianist is, as the common musician in these two duos and as the researcher, the centre of the study. The second relates to the fact that, the circumstances of performance were different, not only because the performers' individual characteristics would naturally impact on the results, but also because there were different venues and repertoire involved. Figure 15 illustrates the action-research study design used, with all steps represented, including variables and methods of observation.

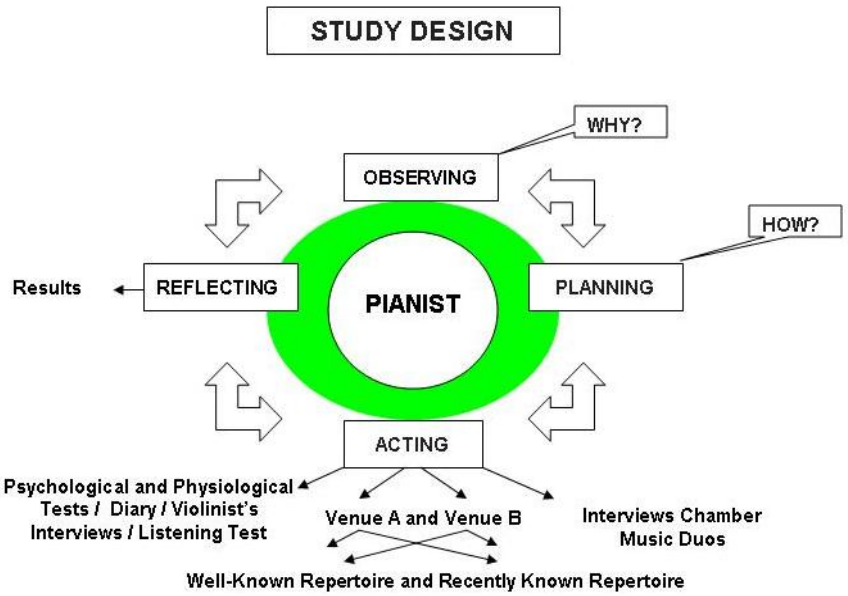


Figure 15. It represents the four phases (observing, planning, acting and reflecting) of the study.

From it, one can infer that there were two series of four duo recitals, all stored in audio-visual recordings. The period of time elapsed between the first series and the

second was approximately five months. During these, there were no significant events that could affect significantly the lives of the participants, and therefore their psychological and physical wellbeing.

The two venues were chosen accordingly to two possible types of audience: more culturally and musically informed and less erudite. For the first, a university venue (VA) was chosen and for the second, a secondary music school auditorium (VB). The concerts were planned such that they would all occur at the same time (6.30 p.m.). For each venue, the two duo performances were separated by twenty-four hours period. The performance conditions were similar to all concerts for each venue: same program (without an interval), same lighting and temperature and with the same page-turner and grand piano.

Two series of concerts were planned: (i) the first (series 1) included only well-known repertoire (WKnR), played in both venues (A and B), giving a total of four concerts; (ii) the second (series 2) included only recently known repertoire (RKnR), especially selected so that it has never been performed before by any of the duo members, played in both venues so that it also gave a total of four concerts, as for the first series. Following, there is a list containing the performed repertoire:

Series 1 programme: (i) W. A. Mozart Sonata in B flat, K378; and (ii) R. Schumann Sonata in D minor, op.121. These two sonatas have been often presented by CDuo so they were chosen as the WKnR.

Series 2 programme: (i) W. A. Mozart Sonata in C major, K.303; and (ii) A. Gedike[13] Sonata, op. 10. These two sonatas were completely new for all duo musicians (RKnR). An additional piece, Mozart, K. 378, was also played because this is a significantly demanding piece in all aspects, i.e. technical, musical and expressive, for both members of the duo.

[13] Alexander Gedicke (or Goedicke) (1877-1957), was a Russian composer, pianist and organist, descendant of a family of German musicians. From 1909, he taught piano and from 1920 organ and chamber music at the Moscow Conservatory.

These series in the study were distributed so that the order of the partner in the duo was randomly allocated. It is important to emphasise that the above pieces were chosen carefully among a vast choice of repertoire, namely taking into account that stylistically, both series of concerts should contain similar pieces in terms of periods (Classical and Romantic) and of musical and technical demands. In addition, in each pair of recitals, performed at intervals of one week, both duos received an unknown new piece of music one week prior to each performance. This "sight-reading" piece was only performed together, for the first time at the day of the concert; it was studied individually but not rehearsed by the duos. These works, never rehearsed, chosen by the supervisor of this work (NLH), were:

- For concerts I and II, *Melancolie*, by J. Field;
- For concerts III and IV, *Valse diabolique* by Eller-Wilhelmj;
- For concerts V and VI, *Bolero* by E. German;
- For concerts VII and VIII *Concertstuck "All'Ungherese" by* A. Wilhelmj.

The author's intentions to include these unrehearsed pieces were to increase, to the maximum, the stress during the performance for both duos and to understand to which extent this stress might be lower for the consolidated duo.

To summarise, Table 5 displays all performances and their distribution according to repertoire, date, duo and venue.

Table 5. Summary of all performances and their distribution according to repertoire, date, duo, and venue. CDuo = consolidated duo; ODuo = newly formed duo; VA = university; VB = secondary school; WKnR = Well-Known Repertoire; RKnR = Recently Known Repertoire.

Performance	Date	Duo	Venue	Repertoire
I	18.01.2012	ODuo	VA	WKnR
II	19.01.2012	CDuo	VA	WKnR
III	26.01.2012	CDuo	VB	WKnR
IV	27.01.2012	ODuo	VB	WKnR
V	14.06.2012	CDuo	VA	RKnR
VI	15.06.2012	ODuo	VA	RKnR
VII	21.06.2012	ODuo	VB	RKnR
VIII	22.06.2012	CDuo	VB	RKnR

As previous studies have suggested, there are also other factors that may impact indirectly on the quality of a performance because they interfere with the performer's self-

perception. Examples of such factors are clothing (Wapnick, Mazza, & Darrow, 1998), the venue temperature and its influence on the bio-mechanics of the hands (Gaydos & Dusek, 1958; Bell, 1981). In spite of the fact that these studies have been focussed on the performance impact in general rather than on specific music performance, the personal musical experience of the author leads her to believe that they in fact may also affect the quality of a duo performance. Therefore, control of the other variables (as for example clothing and shoes) was taken into account, so that for each performance, they were always the same.

In order to understand the procedures used in this study, the following section concerns a detailed description of all dimensions assessed in all performance conditions, i.e. psychological, physiological, and listeners' choice of duo performance.

For the first dimension, there will be a description of the individuals' psychological profiles, applying several standard measures: (i) Minnesota Multiphasic Personality Inventory (MMPI-2); (ii) Kenny Music Performance Anxiety Inventory (K-MPAI); (iii) Clinical Inventory of Self-Concept (ICAC); and (iv) State-Trait Anxiety Inventory-Form (STAI Y1 and Y2). The results will allow the understanding of the impacts of individual characteristics on group dynamics.

The second dimension will include a description of physiological parameters assessed to evaluate the impacts of stress and anxiety in the performance on the individual within a certain group. These physiological parameters include (i) cortisol and (ii) heart beat measures.

Finally, the third dimension concerns the evaluation of to which extent stress and anxiety in performance related to partner changing will affect expert listeners' choices for duo performances.

6.4. Procedures

6.4.1. Psychological dimension

The psychological assessment instruments applied in this study were used for the purposes of psychological evaluation of the selected musicians. The description and the criteria of choice for each of these tests are reported below.

6.4.1.1. Minnesota Multiphasic Personality Inventory (MMPI-2)

This test was applied before starting the experience in order to evaluate the personality of the three musicians. An Italian version for P and V_1 and a Portuguese version for V_2 were used. MMPI-2 is the most widely used clinical test and internationally studied to evaluate the main characteristics of an individual's personality. In addition, it is also used as a tool to guide organizations in selecting employees for working groups. Its application is used for the analysis of psychological and psychiatric aspects, organised in a clinical scale with 10 items (Hathaway & McKinley 1989*).* Despite being developed in a clinical context, the MMPI-2 is widely applied in other contexts, especially in psychology of work (e.g. staff selection, evaluation of candidates), and in forensic psychology (to evaluate criminal characteristics) (Heilbrun, 1992). It is also used in career guidance, and often to support the resolutions of marital problems (Cromwell, Fournier & Olson, 1976; Billings, 1979; Hjemboe & Butcher, 1991). Additionally, because anxiety often impairs performance (Eysenk & Calvo, 1992), there is also much evidence indicating that performance quality of different tasks varies as function of individual differences in trait and state anxiety. For example, high trait anxious individuals have a lower level of performance (Eysenk, 1982). The correlation between general personality and anxiety is also well established, with studies suggesting that personality, in particular the combination of high neuroticism and low extraversion, may play an important role for augmenting the predisposition to anxiety (Gershuny & Sher, 1998).

The current test MMPI-2 consists of 567 items to which the candidate must answer "true" or "false." The average time for testing is 60 to 90 minutes and the data reading must be performed by a professional (clinical psychologist or psychiatrist), who must have specific training skills in the use of this test. Optimally, the MMPI-2 should be carried out to test the potential compatibility of individuals before attempting to create a working group. The Italian version, approved in 1995, (translated by Paolo Pancheri and Saulo Sirigatti, 2004) and its experimental Portuguese version (*Centro de Investigação em Psicologia da Faculdade de Psicologia da Universidade de Lisboa* (Silva, *et al*., 2006) were used.

The three validity scales are designed to assess the extent to which the candidate has completed the questionnaire with sincerity and accuracy:

• The scale L (scale of lying) refers to questions whose answers reflect behaviours shown by almost everyone, and can be “true” or “false”. The situation presented in the questions is more ideal than real and, to be judged more positively, the respondent prefers to falsify the answer.

• The scale F (scale of infrequency) indicates the possibility of exaggeration of symptoms, which may be caused by random answers, simulations of diseases or desires of nonconformity. It also reflects whether the respondent was tired from answering the questionnaire, or lost attention or presented, at this point in time, lack of interest.

• The scale K (correction scale) was developed as a more subtle and more effective index of attempts by examiners to deny psychopathology. It reflects the frankness of the test taker and his/her self-reports: elevated K scores = defensiveness & attempting to make a favourable impression; low K score = excessive self-criticism and/or poor coping skills.

The ten clinical scales include the assessment of: (1) Hypochondriasis; (2) Depression; (3) Hysteria; (4) Psychopathic Deviate; (5) Masculinity-Feminility; (6) Paranoia; (7) Psychasthenia; (8) Schizophrenia; (9) Hypomania; (10) Social Introversion.

This test was applied to the three musicians of this study by a psychiatrist (FR) and a psychologist (AT) who hold professional certificates awarded by the Italian Order of Psychiatrists and the Portuguese Order of Psychologists, respectively.

6.4.1.2. Kenny Music Performance Anxiety Inventory (K-MPAI)

As mentioned in the introduction, the principal aim of this study concerns the impacts of changing partner, venue and repertoire on the pianist’s stress and anxiety levels in music performance. Therefore, it seemed appropriate to use a music performance anxiety inventory. The one chosen was the Dianna Kenny’s revised 40-question emotion-based MPA test (2009). This was because it deals with

> *… three latent factors and twelve underlying factors: (a) early relationship context comprising generational transmission of anxiety and parental empathy; (b) psychological vulnerability comprising controllability, depression, hopelessness, and trust; and (c) proximal performance concerns, comprising somatic anxiety, pre- and post-performance rumination, self/other scrutiny, performance outcome concerns, memory reliability, and commitment to performance. This test was chosen to implement the personality profile of the pianist. These results provide initial evidence of the complex structure of music performance anxiety,*

> *particularly in its severe form, and indicate that management and treatment of the condition will need to be tailored to the individual's pattern of contributing causal features* (cited in Kenny, 2009a: 37).

The original version of this test in English was used due to the lack of available translations to other languages. As previously said, the test was carried out only with the pianist, and the answers were later analysed by a psychologist (AT).

6.4.1.3. Clinical Inventory of Self-Concept (Portuguese version, Inventário Clínico do Auto-Conceito - ICAC)

The Clinical Questionnaire of Self-Concept (ICAC) (Vaz-Serra, 1986) is a trait type test of personality that has been used frequently as a clinical inventory (*ibid.*). In this study, it was carried out to assess emotional and social factors of self-concept. Self-concept has a high negative correlation with social anxiety (Vaz-Serra, Gonçalves & Firmino, 1986). Studies relating self-concept with stress reveal that individuals with high self-concept and feelings of self-efficacy tend to have efficient coping strategies to deal with stressful situations (Vaz-Serra, Firmino & Ramalheira, 1988). So, individuals with higher self-concept create a great capacity to develop positive expectations, whereas the contrary applies to individuals with low self-concept (Vaz-Serra, Antunes & Fimino, 1986). Additionally, individuals with high self-concept tend to attribute success to internal factors (e.g. specific positive characteristics) and failures to external factors (e.g. the situation) (Vaz-Serra, 1988).

The ICAC questionnaire consists of 20 questions that can be rated from 1 to 5 (Lickert scale[14]), designed so that the higher the score, the better the individual's self-concept. It considers four factors: Acceptance/ Social Avoidance, Self-Effectiveness, Psychological Maturity and Impulsiveness-Activity. This questionnaire shows a good internal consistency / reliability and temporal stability (0.791 and 0.838, respectively). The validity of results has been estimated through the correlation between a personal

[14] A Likert scale, named after its inventor the psychologist Rensis Likert (1903-1981), is a psychometric scale commonly involved in research that employs questionnaires being the most widely used approach to scaling responses in survey research. I.e. respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item.

classification of self-concept and the global note of scale, showing a correlation of 0.466. The correlation with every element of the scale has been given a value, while obtaining as well a meaningful statistical correlation for the four elements utilized. The category of Psychological Maturity has the lowest correlation of 0.204 (Vaz-Serra, 1986).

As regards to the procedure, the test ICAC was administered once during a “normal day” to the three musicians of the case study in order to evaluate the self-concept. It too was evaluated by a professional certified psychologist of Portuguese Order of Psychologist (AT).

6.4.1.4. State-Trait Anxiety Inventory Form Y1 and Y2 (Portuguese version)

The State-Trait Anxiety Inventory (STAI) (Spielberger *et al*., 1983) consists of two different sections that evaluate two different aspects of anxiety: State Anxiety (evaluated by Y1 form) and Trait Anxiety (evaluated by Y2 form). Respectively, the State Anxiety represents the intensity of the anxious emotion in a particular time, and it is apparent in feelings of tension, nervousness, worry, anxiety, and neuro-vegetative responses. The Trait Anxiety, instead, consists of a "relatively stable individual disposition" and is thus considered as a characteristic of the subject's personality. The two scales of the STAI consist of twenty questions with a Lickert scale response system of four points. Some questions are quoted in reverse way (inverse items of Y1: 1, 2, 5, 8, 10, 11, 15, 16, 19 e 20; inverse items of Y2: 1, 3, 6, 7, 10, 13, 14, 16 and 19). The response options for the STAI-state (not at all, a little, somewhat, very much) relate the momentary state of mind of the subject. The choice between these different alternatives in the STAI-trait refers, instead, to the usual condition of the subject. Each of these scales scored from 20 (low anxiety) to 80 (high anxiety) (Vaz Serra, 1986).The higher the score, the greater is the anxiety level and can give rise to certain uneasiness, interfering with the performance of an individual. The results of the Portuguese version of this test show qualities that assure the adaptation of the instrument, that is to say high levels of consistence for Y1 (between 0.89 and 0.93) and Y2 (between 0.89 and 0.90) (Silva & Campos, 1998).

Concerning the procedure to carry out this test, the test STAI State-Anxiety and Trait- Anxiety (Y1 and Y2, respectively), were administered by a certified professional psychologist before and after every concert. It is important to note that STAI Y2 is a test of

personality trait that normally should require only one reading. However, in order to be as close to the correct mark as possible, this test was applied throughout the study.

6.4.2. Physiological dimension

As previously explained, information on behavioural and social processes was complemented with biological markers of physiological processes associated with potentially stressful situations. As human beings, we are susceptible to external factors that cause physiological changes in our body. A striking example of external factors is stress. It can cause large variations in the body that can even affect the health of the individual (Adam & Kumari, 2009). There are studies on stress in teachers (Pruessner *et al*.,1999); stress in students (Dickerson & Kemeny, 2004); the effect of cortisol in relation to wound healing (Ebrecth *et al*., 2004); the relationship between stress, cortisol and memory (Oei *et al*., 2006); the relationship between cardiac patients at risk and personality (Sher, 2005), amongst others. Since music is also strongly associated with the evocation of emotions (Khalfa *et al*., 2003), it is possible that music can represent a stressor in contexts such as public performances.

In this study, we attempted to ascertain the levels of salivary cortisol as a physiological response to stress in the three musicians involved in this common project. The main stressor is gauged in the public presentation of musical performances. In particular, eight recitals (a series of four each) were performed and analyzed with two different repertoires in two different environments, as previously alluded to.

6.4.2.1. Cortisol

Cortisol is a steroid hormone of gluco-corticoids family, produced by the top of the adrenal gland of the endocrine system. It is stimulated by adrenocorticotropic hormone (ACTH). This is produced in the anterior lobe or adenohypophysis of the pituitary gland. The release of the hormone is controlled by the hypothalamic corticotropin-releasing hormone (CRH) (Binkley, 1995).

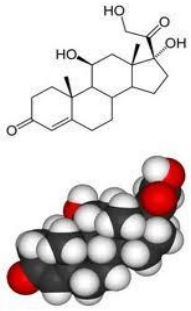


Figure 16. Chemical structure of cortisol (adapted from http://fnquimica.forum-livre.com - cortisol molecule - accessed June 2, 2013: 8 a.m.).

Cortisol has a well-defined diurnal rhythm being strongly influenced by the process of waking up. This rhythm is characterized by high levels on waking - a substantial increase (50-60%) in cortisol in thirty-forty minutes after waking up (CAR - Cortisol Awakening Response) - and subsequent decline in these levels during the rest of the day, reaching minimum concentration around the time of sleep (Soares & Pereira, 2006; Adam & Kumari, 2009). Therefore, in general, in healthy people, the release of cortisol has a diurnal rhythm fairly well defined (8 a.m. - midnight). Obviously, this pattern may be associated with feeding times, since the essential functions include maintenance of cortisol glucose production, one of the stimulating gluconeogenesis, leading to the production of glycogen from non carboidratate sources in liver (Salimetrics, 2010).

This glucocorticoid has also effects on protein metabolism by increasing the synthesis of proteins and RNA (ribonucleic acid) in the liver, leading to increase of amino acids in movement (Soares & Pereira, 2006). Other functions include immune regulation and anti-inflammatory action. In the immune system, cortisol plays an important role. When the cortisol is present in high concentrations, it promotes immune-suppression, stopping protein synthesis, including the immunoglobulin. Moreover, high levels of cortisol also lead to the atrophy of the lymphoid tissue, spleen and lymph nodes (Soares & Pereira, 2006). The deviations from the typical diurnal cycle seem to provide valuable information on environmental influences and have an important role in disease processes. The diurnal rhythm of cortisol is then related to the body's circadian rhythm, the body's biological cycle with, approximately, a period of one day (Adam & Kumari, 2009). Other studies have shown that many people do not have the expected diurnal rhythm of cortisol secretion (Stone, 2001). Different levels of cortisol were noted as well as in women who survived breast cancer with a pending cortisol level flatter than normal and with a lower

decline at night hours (Bower, 2005). Differences in cortisol responses also were founded in relation to socioeconomic status (Steptoe *et al*., 2003; Ebrecth-Kunz *et al*., 2004), to family environment and / or stressful work (Adam & Gunnar, 2001) or to chronic stress (McEwen, 1993). Besides, interesting studies have analyzed the behaviour of cortisol in professional sportsmen (Pazikas & Aoki, 2005; dos Santos *et al*., 2005), insomnia in menopause and premenopausa (Soares, 2006), or as a variable in health psychology (Soares & Alves, 2006).

Several elements interact to maintain the circadian cycle and enable the individual to tailor the sleep/ wake cycle to the day / night cycle of the earth, i.e. agents such as light, heat of the day, darkness, ambient temperature reduction at night, variations in the incidence of light during the day, watches, and sounds from the external environment enable to maintain a rate of activity in the circadian rhythm. Also, endogenous factors allow a syncronicity with the circadian cycle of the earth. The body thus presents complex cycles and hormonal secretion of neurotransmitters and, in this sense, the effect of light has much influence on the circadian cycle, because this stimulus will also act on the pineal gland, which produces melatonin (Fernandes, 2006).

Cortisol, like insulin, facilitates wakefulness, by promoting increased metabolic rate. This sleep-wake cycle is regulated by a neuro-chemical and functional complex bio-rhythm, which needs time to adapt to changes, imposed by new habits or major time zone changes. It is then the set of somato-sensory stimuli, such as the upright position and visual, auditory, olfactory and gustatory stimuli that promote wakefulness after to be processed by the thalamus and the cerebral cortex (Fernandes, 2006). The increase of cortisol after waking is independent from the hour of this event or the fact to be induced by an alarm clock or be spontaneous, being considered a response to the process of waking up.

A study of cortisol levels correlated with blood glucose suggests that this rise after waking up is related to the metabolic requirements that enable the individual to meet the challenges of the day (Hucklebridge *et al.*, 1999). As already stated, the presence of moderate levels of cortisol during the day is required for the maintenance of several basic physiological processes, such as cardiovascular function and immune function. In the gastrointestinal tract, for example, excess cortisol can lead to ulceration of the gastric mucosa, because of its stimulant action on gastric acid secretion (Smith & Pereira, 2006). Therefore, a signal disrupting the endocrine response to stress is an altered circadian

rhythm of cortisol. In this cycle, these agents have been associated with psychological stressors. Physically healthy individuals with alterations in circadian rhythms of cortisol have been characterized as chronically stressed and with aberrant rhythms depression associated (Keavney *et al*., 2005). Overall, these states are associated mainly with high cortisol levels, but some studies show that in patients with Post Traumatic Stress these values tend to be low. In cases of trauma it is suggested that the acute elevation of cortisol produce a toxic environment in the hippocampus region, leading to destruction of neuro-chemical receptors. This may explain why rape victims with a history of violence have lower levels of cortisol than those found in rape victims without such history (Soares & Pereira, 2006).

So, an excess of stress, which triggers an increase in cortisol levels regardless of the circadian cycle, thus it can lead to physiological changes, and emotional, cognitive and behavioural disorders. It follows a great importance for the human being and also for the musician who evidently on stage, lives a stressful situation.

Studies reveal that there is a strong relationship between depression and decreased lymphocyte production and activity of NK[15] (natural killer) cells. Thus, depression and adverse life events can increase the risk of developing diseases due to immune deficiency induced in the individual. This reinforces the choice to realize the MMPI-2 from which, among other parameters, the user can see the inclination to a possible personality trait of the individual tending to depression. Consequently, the stress and trait personality are then implicated in the development of several pathologies such as those of a psychological nature, and aggravation of diseases such as cancer, infectious diseases and autoimmune diseases (Soares & Pereira, 2006).

Cortisol in biologically active form has small dimensions and it is highly lipid-soluble and it can diffuse itself across cell membranes to the saliva. Therefore, salivary cortisol has been widely studied as an indicator of the response to stress. Another major

[15] Natural killer cells or NK cells or NK-cells are cells of the immune system, particularly important in the recognition and destruction of tumor cells and virus-infected. They are an important object of study in cancer research. They are the only cells of the immune system that are not produced during the life of the organism and are formed in fact, formed during the twelfth week of embryonic development.

advantage of the study of cortisol in saliva is the failure to use invasive or stressful procedures, not requiring medical personnel for their harvest (Soares & Pereira, 2006). Another parameter often analyzed is the reactivity of cortisol to the momentary stress, i.e. the increase of cortisol, higher than normal, at a given time (Adam & Kumari, 2009). This last parameter is one of the most interesting about this study, since cortisol typically increases in front of a situation of stress after about ten minutes of exposure and then gradually returns to normal (Ruttle, 2008).

Musical performances or other performance situations like public speaking (Bassett, Marshall & Spillane, 1987; Al'Absi *et al*., 1997, Hennig, Netter & Voigt, 2001; Garcia-Leal *et a*l., 2005; Alfano, 2008; Soares Pereira & 2006) can represent particularly stressful moments for musicians, because of the complex emotional/physiological factors involved in it. Obviously, since psychological stress in performance has been associated with cognitive deficits, memory lapses and attention problems, this can have serious consequences "acting in the performance of musicians and learning capacity" (Alfano, 2008). This is the reason for which cortisol can be an important marker in understanding psycho-physiological response in performance context. So, this case study provides an interdisciplinary approach complemented with biological data. By measuring salivary cortisol levels in the musicians during their performances, the impact of these episodes in potentially stressful situations can be measured.

6.4.2.1.1. Saliva Test - Cortisol

Saliva is a useful biomarker in stress research (Hellhammer *et al*., 2009; Hjortskov, *et al*., 2004; Ng *et al*., 2003). Cortisol is often defined as a "stress hormone" because its output increases, in fact, in conditions of severe psycho-physical stress, for example after a very intense exercise or surgical interventions. A brief explanation on different manners of measuring cortisol levels are presented below.

Until recently, hormonal tests (including cortisol) were performed taking blood samples. However, collection of blood has some limitations. It is not only something invasive but also difficult for accurate timing. In this aspect, the time of collection of saliva may be chosen precisely, because it is a precise and flexible tool. Therefore, one of the main advantages of using the immunoassay saliva test is the ease of sample collection (just put the sponge under the tongue during a few minutes). In addition, given the ease

with which one can obtain multiple samples, the saliva test is particularly useful for serial biological evaluations (hours, days or weeks).

The specific saliva test must be performed by multiple measurements during the day, and one of the parameters is also the context in which it happens to saliva collection. Finally, all these data were compared with data collected in a "normal" day, i.e. on a day in which the group members did not have to face special situations of emotional stress.

Clinically significant differences in the response of cortisol levels between men and women are still unknown. However, in some specific cases, as for example in anticipated psychological stress (of which men revealed a much higher concentration of cortisol) or, for example, in relation to the follicular phase and the luteal phase of women, or as response of acute psychological stress, studies have revealed different levels of cortisol connected to the sex of the individual (Kirschbaum *et al*., 1992; Takai *et al*., 2007).

6.4.2.1.2. Collection method, material and subjects

The analysis of salivary cortisol levels was made for the three musicians, assessing impacts of changing repertoire, venue and partner in performance of violin-piano duo. For each recital, nine samples were taken with each participant, distributed throughout the day:

1. Waking up
2. 45 minutes after waking
3. 11 am
4. 2 pm
5. 4 pm
6. Shortly before starting the performance (“A”)
7. Shortly after the performance (“B”)
8. 30 Minutes after the end of the performance (“C”)
9. At bedtime

In a normal day (i.e. not a performance day), 8 samples were taken from each participant (waking; 45min after waking; 11 a.m.; 2 p.m.; 5 p.m.; 7.30 p.m.; 9 p.m. and 12 am). In this study, the normal day readings were made. However, the results of selected moments were used to substantiate the study. These are referred to as Time "A", "B", and "C".

Although the cortisol values do not depend on the specific time of waking up (Hucklebridge *et al*., 1999), it was always noted the time of such event in all study participants to better understand the evolution of the daily cortisol and to better compare each data.

The three subjects who cooperated in this study were informed of their rights as participants in research, agreed with the protocol and to use their saliva to scan salivary cortisol. They were also asked not to eat in the hour prior to cortisol collection and not to drink water ten minutes before drawing the sample (Salimetrics, 2010). All samples that were collected were properly identified and properly stored. To collect saliva samples Oral SWAB's (SOS) of Salimetrics® were used (Figure 17). These are little sponges that absorb saliva. These sponges are placed under the tongue and should remain there for one to two minutes in order to saturate them with saliva and immediately thereafter they are placed in a tube itself as one can see in the following Figure 17.

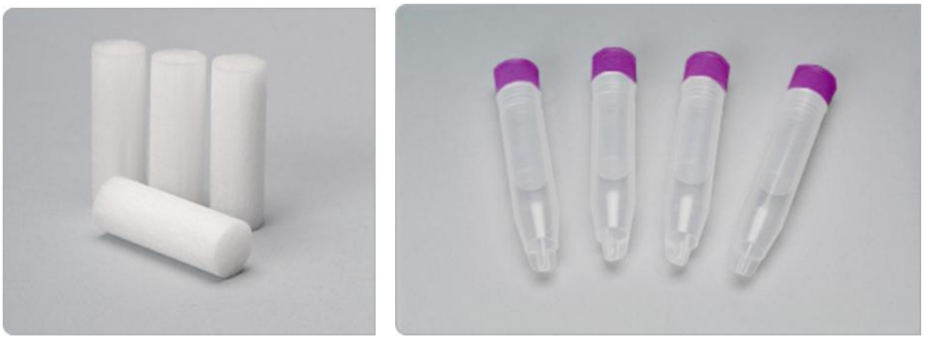


Figure 17. Salimetrics Oral Swab (SOS) and tube, with a small insert and snap cap used for storing saliva samples collected via swab(s) (adapted from www.salimetrics.com, accessed June 2, 2013: 9 a.m.)

The samples were frozen at temperatures below -20º C in less than two hours after collections. They were well maintained until the day in which they were analyzed. The day before starting the test (analyses of the sponges) they were brought to room temperature to thaw and then centrifuged for fifteen minutes at 3000 rpm (rotations per minute). After

the use, the samples were returned to the freezer. Nevertheless, cycles of freezing and thawing should be avoided if possible, because they may interfere with the results (Salimetrics, 2010).

To reduce and minimize the experimental error caused by inaccuracy, all samples were analyzed together with standards. Wherever possible samples were also analyzed in duplicate to minimize potential errors and enhance the results.

The software chosen to handle the data was *GraphPad Prism 5*[16], itself for treating bio-statistics, modelling, and obtaining graphs of biological data (*GraphPad Prism*, 2011). With the support of this software, the statistical analysis used for the data was essentially ANOVA and Bonferroni post-test. (For more technical information, kindly given by biologist MJS, see Appendix 5).

6.4.2.2. Heart Rate

The moment of musical performance is a complex phenomenon that calls into play many factors, both psychological and physiological. For this reason, heart rate (HR) has been monitored in the three musicians involved in the study using a device, called VitalJacket® (Biodevices, SA, Portugal) which combines complex bioengineering and wearable technology. The pianist and the two violinists were without special physical and / or psychological problems.

Contrary to a common assumption, a healthy heart should not beat regularly as a metronome. On the contrary "irregularity and unpredictability are important features of health" (Galdberger & David, 1990; Cysarz *et al*., 2007). According to Galdberger & David (1990), the human heartbeat series is more variable and, hence, more complex in healthy subjects than in congestive heart failure patients. To confirm this, a young man has normally a big variable cardiac frequency that changes with breathing, while at the other extreme there may be an elderly or diabetic neuropathy with this mechanism reduced,

[16]GraphPad Prism is a powerful combination of biostatistics, curve fitting (nonlinear regression) and scientific graphing in one comprehensive program.

exposing it to significant cardiovascular risks (O'Brien *et al.,* 1986). In fact, the interval between minimum and maximum heart rate may define our level of health. As the physical condition of a person deteriorates, this interval can really become closed to the point of limiting one's own ability to adapt to the stresses of daily life. There after, any unexpected and stressful condition may lead to limit the individual's adaptability and create a risk of cardiovascular events and even death. Nor should we forget, as we have already seen in the discussion of cortisol, the enormous influence that hormones may have on the functioning of the heart and blood pressure (Patterson *et al*., 1914).

The heartbeat is naturally influenced by physiologic elements and constantly varies (Fagard *et al.,* 1999). The most obvious of these factors is physical activity (Hottenrott *et al*., 2006). Other variables influence the number of heart beats *per* minute as the age (O'Brien, 1986), and the specific times of the day. Differences regarding gender and reactions during the digestive phase were also disclosed (Ryan *et al*, 1994, Liao *et al*., 1995; Yamasaki *et al.*, 1996; Yeragani *et al.,* 1997; Kuo *et al*., 1999) and reactions during the digestive phase: especially after lunch, or with the intake of fructose, heart rate (HR) tends to increase (Hayano *et al*., 1990; Watanabe, 1996; Lu, 1999, Brown *et al*., 2008). Therefore, the variables that can cause imbalance and differences in HR, which increase or decrease can precipitously cause specific diseases and determine the change continues, are many. Also emotions, stress, an extemporaneous shock, or any physical workout, may cause increased heart rate that is considered in this case to be completely normal.

6.4.2.2.1. The heart and the emotions

It is just because of its sensitivity to the emotions that the heart, in antiquity, was considered the centre of noblest activities, the seat of the soul. In ancient Egypt, for example, it was thought that the heart was the seat not only of life but also the intellect (Assmann, 1997). This very high conception of the heart lasted very long and the reason exists because the emotions accelerate the heart rate, and it is in the heart that we feel the alterations of our mood. In other words, the heart responds to the wonder, fear, and love, as well as responds to the stress of an effort during an athletic contest (Ali & Farrally, 1991). For example, the heart rate slows when the subject is placed in front of relaxing images. A dramatic scene, however, increases rapidly the beat: in a short time the pulse rate can be up to 120 per minute. How can something like this happen? The reason lies in a physiological mechanism: the preparation of the body to fight and escape ("fight or

flight"), which requires the rapid delivery of oxygen and energy to the organs that need it (White, 1959, McCraty *et al*., 1993; McCraty *et al*., 1995; McCraty *et al*., 1998; Kubzansky & Kawachi, 2000; Sirois & Burg, 2003; Rainville *et al*., 2006).

The heart and the brain are connected in many ways (Appelhans & Luecken, 2006; Thayer & Lane, 2009; Lane *et al*., 2009). The thoughts, feelings, emotions can directly or indirectly influence the heartbeat through hormones and through the neural circuits (McCraty *et al*., 1995). We simply could say that an image is first interpreted by the thinking part of the brain, the so-called cortex. If this image creates an alarm, the cortex stimulates the hypothalamus, which in turn activates the archaic centres of the bulb, where are the primary systems of survival. Hence the stimulation is radiated along the so-called autonomic nervous system, composed of the sympathetic and parasympathetic. It is the sympathetic nervous system that creates the mobilization of the body, stimulating the production of particular substances such as adrenaline and noradrenaline. Thus, arteries are contracted, the pressure increases and the heart rate speeds up. Owing to the contraction of the arteries there is a saving of blood on the outskirts, (it is for this reason that we grow pale with emotion and hands get cold), in favour of its maximum and quickly hijacking where it is required by the general mobilization of the organism. And if the emotion is really strong, the hyper-stimulation of the bulb can excite even the centres that govern the nausea or intestinal mobility, creating repercussions in the stomach and intestines: it is known as panic.

The other channel of the autonomic nervous system (parasympathetic), also known as the vagus nerve, has an opposite role: namely, to dilate the vessels and thus decrease the pressure and to slow the heart rate. It depends on one or the other system, the sympathetic or parasympathetic, which hides the various emotional situations, to which our body knows how to react (Porges, 1995). And this explains the diversity of reaction in individuals faced with the same event. In other words, the range of emotions (e.g. fear, anger, love, joy) can create different responses in different individuals. Sometimes it can cause fainting. In some people, in fact, a strong emotion can cause a significant imbalance between sympathetic and parasympathetic, with a sudden fall in blood pressure and insufficient blood supply to the brain. The individual, in this case, loses consciousness (faints) (Wiens, Mezzacappa, & Katkin, 2000; McCraty *et al*., 1995).

The emotions (and thus, heart rate) can be controlled by education, but only within certain limits. The idea of exercising the cardiovascular system to maintain the widest

possible range of heart rate adaptability is not new. Doctors have prescribed exercise (Hottenrott, Hoos & Esperer, 2006) and stress management through techniques such as meditation or yoga (Sarang & Telles, 2006; Phongsuphap, 2008).

In recent years, the method of bio-feedback gained serious recognition from professional occupations related to health care. In biofeedback, a set of standard signal, processing methods and analysis that was proposed in 1996, has been widely accepted by professionals. Hence, equipment manufacturers for biofeedback have been developed and tested for application in various clinical conditions (Lehrer *et al*., 2007).

Research shows sufficient evidence of success that puts the Heart Rate Variability (HRV) biofeedback in front of many other methods of self-regulation in terms of acceptance by traditional medicine (Meichenbaum, 1976; Achmon *et al*., 1989; Ahuja, 2003).

Heart rate is the effective number of heartbeats each minute, often referred to as "beats per minute" or "bpm". Just to have an idea, a heart beats, on the average, 80 times per minute. That calculates to 115.200 beats per day (80 x 60 x 24) and 42.048.000 times a year.

In recent decades, biofeedback techniques and various other devices were developed to measure the HR. Much importance has been given to the measurement of the relationship heart / breath, to determine the degree of coherence / sync heart rate and respiratory rate.

The synchronization of physiological processes, or "chaotic" respiration and heart rate, can be documented with computerized biofeedback formats. The test is performed using a chest strap or a clip headset with detection computerized. It was noted that in emotional states such as love or gratitude / humility or states of joy there is a perfect synchronization between heart rate and respiratory rate. This state of balance and harmonic synchronization disappears under negative stress with anger or fear (McCraty *et al*., 1995). In the USA, much research has been devoted to determine the possibility of "training" the coherence of the heart and of the respiration (Miu *et al*., 2009). In this field, the technique of HR-Biofeedback is used with great success, because biofeedback HR method is detected as the complementary method in harmony with the patient's behaviour: it is revealed usefull in psychotherapy, sleep disorders, depression, states of anxiety, stress and in the prevention of myocardial infarction (Siepmann *et al*., 2008).

6.4.2.2.2. Material and Procedure - VitalJacket®

These HR measurements were taken on recital days between 18h15-19h45: (i) 18h15/18h30, about 15 minutes before the recitals; (ii) 18h30/19h30 about an hour's recital; and (iii) 19h30/19h45 about 15 minutes after the recital. The subsequent analysis of each concert results was divided into 15-minute period that allowed us to verify the events that could have occurred and might deserve some consideration.

The following Table 6 shows an example of exam and the 15-minute period of analysis. Obviously, knowing the duration of the pieces, this division in 15 minutes allowed to make the evaluations also in relation to specific piece as, for example, the never rehearsed pieces.

Table 6. Example of measurement of heart rate (HR), considering "at rest" the time before and after the performance. CF = cardiac frequency.

Period	Start	End	CF Min	CF Mean	CF Max
At rest	18:14:58	18:29:59	80	104	133
During Performance	18:30:00	18:44:59	84	107	127
During Performance	18:45:00	18:59:59	90	108	128
During Performance	19:00:00	19:14:59	91	110	130
During Performance	19:15:00	19:30:00	88	114	138
At rest	19:30:00	19:44:10	106	116	127
Mean HR			80	110	138

VitalJacket® (VJ) is a vital signs monitor that we can "wear" (Cunha, 2010) and that is absolutely non-invasive. This t-shirt, designed especially for patients in cardiology and sportsmen, is practically a t-shirt that unites the tissue with micro-electronics and was born after many years of development in the laboratory of the University of Aveiro, Portugal. The concept was designed and specified based on the tradition of biomedical instrumentation and telemedicine important IEETA Institute (Institute of Electronic Engineering and Telematics of Aveiro University) that has developed the entire microelectronics, information technology and communications, collaborated with CITEVE - Technological Centre for the Textile and Clothing Industries of Portugal - a non-profit organization of 600 Portuguese textile industry partners. In 2007, this development has

been licensed to a small biomedical engineering company, called Biodevices, which has helped to develop the first prototype, "focusing on the possibility of using something wearable in the field of cardiology and high performance in sport, just putting it with a shirt underneath: all this accompanied by the development of textile Petratex SA" [17].

The process of construction of the VJ was certified in 2009.[18] The cardiology version, approved by the Medical Device Directive (MDD), encompasses the regulation of requirements for medical devices at the European level. Possible usage scenarios of the VJ, have been presented at the 4th International ICST (the non-profit Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering) Conference on Pervasive Computing Technologies for Healthcare 2010, Munich, Germany. VitalJacket was also chosen as "an example of excellence of Portuguese lead technologies. A challenge was made by Catholic University of Portugal in order to offer products representing national technology to the Pope Benedict XVI" (http://www.vitaljacket.com/?cat=10, accessed on May 23, 2013 7 p.m.). It was designed and developed to be a useful approach for different practices and clinical settings, in hospitals, at home or on the go, for people who need frequent or continuous monitoring, high quality, of the vital signs of the wearer.

Furthermore, this piece is washable, easy to use because it uses electrodes and a large number of these monitors can be connected to your IT infrastructure (IT Infrastructure is basically an infrastructure of information technologies). All variables are critically transmitted through wireless channels, stored and processed to generate alarms. Trends and graphs of results are presented to health professionals across the IT infrastructure. The non-invasive characteristic (quality) of the VJ has permitted the

[17] Biodevieces, SA is a spin-off from the Institute of Electronics and Telematic Engineering of Aveiro (IEETA), Aveiro University with the mission to develop, commercialize and export biomedical engineering solutions for medical diagnosis (adapted from http://www2.biodevices.pt:81/en/homepage/, accessed May, 23, 2013: 2 p.m.).

[18] "On October 2009, VitalJacket® was certified according to the European Directive 93/42/EEC, proving to be in conformity with all the provisions of this directive therefore bearing the CE mark enabling the product to move freely within the Community and to be put into service in accordance with its intended purpose" (adapted from http://www2.biodevices.pt:81/en/certifiations/, accessed May 23, 2013: 11 a.m.).

utilisation in live concerts without discomfort of the musician and without the audience seeing it.

6.4.2.2.3. History and evolution of VitalJacket®

The VitalJacket® had a long transformation, over the years. In Figure 18, one can see the prototype (year 2000), which was too heavy and complicated. In Figure 19, one can observe on top the first commercial product and structure that was inside (wires and embedded chips) and, below, the follow step of VJ's evolution: a t-shirt without seams.

Figure 18. Protoype of VitalJacket®. It is possible to note that the dispositive was very complex in term of electronics components and that it was almost impossible to use it during the normal life.

Figure 19. Figure shows the first commercial product and structure that was inside (wires and embedded chips) that looks more confortable than prototype on the top, and a t-shirt without seams below.

The first version evolved and a subsequent line of products was created that focused specifically on the areas of cardiology and sports performance. The first version of the VitalJacket® was composed of two parts (a transparent shirt with elastic properties where sensors were framed and a jacket which had been inserted with micro electronics). The sports version is more evolved and consists of a simple t-shirt with embedded electronics. This type is now the commercial version available in the international market. In Figure 20 one can see the two models.

Figure 20. The two models of VJ used in the beginning in the cardiology area and in sport fields. Actually the sport version is also used in cardiology mean.

Used in sports or other performance venues such as music concerts, the VJ can conduct a clinical quality electrocardiogram (ECG) and send all information on heart rate through the bluetooth (wireless) system or send the information to a Personal Digital Assistant (PDA). At the same time, all the data are stored on a card, or computer chip, to perform "analysis" of the data later. Moreover, in the version used in cardiology, the data are sent directly to a cardiology unit via wireless LAN, GPRS or UMTS[19].

[19] GPRS and UMTS - Universal Mobile Telecommunications System - are communication protocols for mobile data as those used in our mobile phones every day. UMTS is commonly known as 3G, third generation capabilities and provides higher data rate than GPRS, which is the oldest technology.

The most important VJ's aspects are the clinical high quality of ECG; medical certification; capacity to measure ECG during normal activity in our lives (ex. during sport activity, during work and, in this study, during a violin and piano concert etc.); to be able monitoring online and storage information consecutively during until seven days. Currently the VJ is used in several hospitals in several countries (Portugal and Brasil, also having trials at the moment in UK, Spain and Israel). Figure 21 summarizes the technical features of VJ.

TECHNICAL FEATURES	VITALJACKET®
Recording Time	up to 7 days
Frequency Response	0,03-150 Hz
Sampling Frequency	500 Hz/channel
A/D Conversion	10 bit/channel
Input Impedance	>10 Mohm
Input Dynamic Range	A/C ±6,5 mV
Electrodes Offset Tolerance	±300 mV
Common Mode Rejection	>95 Db
Weight	50 g (with battery)
Dimensions	66x38x16 mm
Channels	1-5
Power Requirements	Li-Ion Battery 3,7 V; 1050 mA
Memory Data Support	Memory SD Card
Memory	1 GB

Figure 21. Technical characteristics of VitalJacket®. The figure was kindly given by Catarina Ricca (Biodevices) by personal email correspondence between her and the author.

6.4.2.2.4. Application of VJ in Music domain

In musical contexts, one of the first studies was conducted in 2010/2011 to detect stress during an intensive memorization process and resulting performance of a 4-voice fugue by solo pianists (Harper *et al*., 2011). Another recent doctoral study used the VJ to look at stress reactions in moments of silence in solo performances by an oboist (Oliveira e Silva *et al.*, 2013). Both studies were conducted at the University of Aveiro under the guidance of Dr. Nancy Harper.

The present study, however, represents the first work regarding an instrumental duo. Not surprising, since so far it was impossible to monitor the heartbeat in a non-invasive way. The revolutionary system of VJ allows any musician to monitor one's own heartbeat and emotional reactions on stage because it is wireless, invisible and discreet, comfortable, and will not harass or impede performance. As is obvious from the above

explanation illustrated, so far the old VJ was something very heavy and complicated, involved a number of drawbacks, which didn't leave many possibilities to use it in a live concert.

6.4.3. Perceptual evaluations

> *… Psychology of Music may be divided into three large fields dealing with the musician, the music and the listener, respectively… the first great step in approaching the psychology of music is to recognize that everything that the singer or player conveys to the listener is conveyed through sound waves or in terms of these... But, the reader may say, music is more than sound. It must have atmosphere; it ordinarily involves some degree of dramatic action; it is modified by the character of the audience, the personal appearance, manner and mannerism of the performer, the total situation of which the performance is a part. In other words music is essentially tied up with a larger setting in which it plays a leading role… It also is admitted that the music is in the first and last instance, in the mind of composer and in the mind of the listener, not actual sounds, but images ideas, ideals, thought and emotions* (in Seashore, 1938: 13).

One important aim of this investigation was to understand whether partner change in performance affects expert listeners' choices for duo performance in terms of musical communication. As explained earlier on in this thesis, musical communication involves at least three important components: the musician (the messenger), the performance (the message itself), and the listener (the receptor). In the case of a duo performance, loop interactions are established adding higher levels of complexity: (i) a message is created by two different individuals in real-time; and (ii) this same message is decoded by an audience that, besides musical meaning, evaluates also inter-performer communication.

Thus, it seemed important to evaluate not only the duo members' psychological characteristics and psychological and physiological responses to performance, but also to include the perceptions of expert listeners (a panel of experienced pianists) of preference for duo, in terms of music communication. One question to be answered is whether both psychological and physiological responses between a consolidated group and a newly formed influence the expert listeners' choices.

We know that expressiveness has a fundamental role in perception and human interaction, as well as cognitive choices made on a rational level (Canazza *et al*., 2003). Interesting studies have been made in the field of the perception of emotions by using computer programs to assess the differences in interpretation. These programs can

produce different performances in relation to different emotional expressions (Bresin & Friberg, 2000), as it is known that the intentions of the performer can be fully understood by the listener if the performer has the will to transmit specific emotional characters to listeners, regardless of the instrument (Gabrielsson & Juslin, 1996; Juslin, 1997).

For the purposes of the current study, all repertoire material was recorded during the eight recitals. From these recordings, excerpts from the sonatas by Mozart and Goeticke (indicated below) were used for the listening tests. The repertoire was chosen so as not to favour either the Consolidated Duo or the Occasional Duo. The following excerpts were chosen for the listening tests:

- W.A. Mozart (1756 – 1791) Sonata in C Major K.303: 1st movement, ms. 84-94;
- W.A. Mozart (1756 – 1791) Sonata B flat M K.378: 1st movement, ms. 52-72;
- A. Gedicke (1977- 1957) Sonata op. 10: 1st movement, ms.1-25;
- A. Gedicke (1977- 1957) Sonata op. 10: 2nd movement, ms. 1-28.

6.4.3.1. Materials and Procedure

Each of these excerpts was duplicated, double blinded and allocated in the test in a random order. This procedure was done using the *Glue* software created by Swedish Svante Granqvist to ensure that neither the researcher nor the participants would know which stimuli corresponded to which duo. Also, this methodological approach will allow for analysis of consistency of responses. Those evaluators that will show a poor consistency rating for replicated stimuli will be not considered for analysis. The stimuli were separated by a 4 seconds pause and lasted a total of 24:11'' minutes. There were a total of 16 stimuli. Only audio examples were evaluated.

This was done by removing the visual content from the video film of the recitals using the program *Sound Forge Pro 10.0*[20]. The content of recitals was carefully listened to for several times in order to decide which excerpts to choose. Then, the examples were

[20] *Sound Forge* is a professional audio editing program. It offers all the necessary options to edit, convert, and enhance audio files of all types.

"cleaned up" by removing clapping or any other noise that might help to identify the performers in the excerpts. This was done with the program AVS *Video ReMaker 4.0*[21] and subsequently reduced to sonic wave by using the program *Audacity 2.0.2*[22].

These stimuli were recorded from the software and given to a group of 30 musicians (professional musicians). Each of these evaluators was asked to listen to each stimulus only once (the test was done in such a manner, that listeners could not pause or rewind tracks), in a quiet room, using a computer and the same headphones (to ensure that listening conditions were similar to every evaluator). They were asked to indicate, in a nominal dichotomous comparative test of choice, which of the two-paired samples they preferred in terms of: (i) synchronization and (ii) dialogue, between the pianist and the violinist in the duo.

To evaluate the Synchronization parameter (from Greek *συγχρονισμός*[23] composed of *syn* = with ad *chronos* = tempo) excerpts were chosen from Mozart Sonatas where the character was clearer and where the aspect of virtuosity expose the musicians to a more rigorous assessment in terms of synchronization.

Regarding the Dialogue parameter (from Greek *διάλογος*[24] composed of *dia* = between and *logos* = discourse) excerpts were used from a Sonata by Gedicke, (Romantic period), giving more space to fluctuations that imply complicity between musicians.

[21] *AVS Video ReMaker* is a software that enables you to edit video files without the need to convert the files. Using this software you can cut unwanted scenes from your home videos whether they were made via PVR, DVR and DVD. You can also change the scene sequence of videos without the need to convert them at all. You can also use it to create menus from DVD and Blu-Ray. It is compatible with a variety of video formats including HD videos, DV AVI, MP4, WMV, 3GP, 3G2, QuickTime, DVD, VOB and MPG.

[22] *Audacity* is an audio editor that can record, playback and import / export sounds in WAV Waveform Audio File Format), AIFF (Audio Interchange File Format), MP3 (audio-specific format that is part of MPEG - Moving Picture Experts Group) and others.

[23] Pianigiani, O. (1991). *Vocabolario Etimologico della Lingua Italiana*. Ed. Polaris.

[24] Pianigiani, O. Vocabolario Etimologico della Lingua Italiana. Ed. Polaris.

The question was worded in this way: for this pair of stimuli presented here, choose the excerpt with a better synchronization between the violin and the piano. The same question was repeated for dialogue.

Synchronization was a chosen parameter because

> … [it is] *the most fundamental requirement of any ensemble is that the individual parts fit together. It is necessary, therefore, for each musician to be able to perform in time with the rest of the group; indeed, the coordination of an ensemble is all about timing (…) the overall tempo therefore functions as the ensemble's clock, for it provides a source of coordination and controls the beat ticking inside each musician* (Goodman, 2002: 153-154).

We know that playing with others in small *ensembles*, a Duo format in this case, implies the ability to have a perception of common *tactus*[25] and maintaining the same is not limited to a simple function of keeping the time. In other words, musicians of a small chamber music group that perform without a conductor must have two very important skills: anticipation and reaction through a feedback mechanism. The players must cooperate and interact amongst themselves in an attitude of support, as if "hunting", in the sense that

> *one musician follows another just as the hunter tracks its prey by anticipating and reacting to its movements… In effect there is a fine line between cooperating and hunting, and such skills might be affected by dominant personalities in the ensemble as well as the nature of the music itself (for instance, an accompanist might follow the performer who has the melody*) (Goodman, 2002:154-155).

Obviously, the approximate timing of the performance can be planned during the rehearsal. However, it will be impossible to decide the normal and unpredictable small fluctuations due to the expressivity and emotion of performance. Therefore, the musicians must have a great sensitivity to react to the other, at every moment (Shaffer, 1984).

Another important parameter in chamber music is inter-personal communication between duo members, or dialogue. Obviously, the music itself will dictate, to a certain degree, who is the "leader" and who is the "follower". Good musicians will not only be

[25] Latin term (literally "touch") that in the Renaissance it was indicated what today is called a bar (from *Dizionario della Musica e dei Musicisti*, 1994, UTET, Turin, p. 478).

aware of this important aspect of interpretation in the main voices of the music, but they also will find ways to bring out the inner voices in their musical dialogue.

According to Gadamer (cited in Benson, 2003: 15) dialogue is the "logical structure of openness". In effect, a musical dialogue can be interpreted as the capacity to be open, in real time, to the other, to response. It requires one to be mentally and emotionally "open" to be able to answer to the sound and musical proposal of the other musicians who transmit ideas through them. A good verbal dialogue presupposes capacity of hearing ad capacity to be open to the other (towards). In the musical field it is the same. There is not a true dialogue without this "openness" and flexibility to interact with the other(s). Dialogue is based more on the structure of composition that reveals in itself the hierarchy between voices. For that, musical dialogue in Western music will be determined, above all, by the little fluctuations of time and, even more, by the capacity to "speak" through the sound. Open dialogues are governed by rules that are flexible – and are themselves open to continuing modification. It hardly needs to be said that, viewed as a dialogue, the practise of classical music is not particularly open (Benson, 2003). However, if one thinks like that, then there would be no justification for the presence of so many excellent performers who demonstrate, even though the text is always the same, that it is possible to say different things using the same notes or words.

The author often says to her students that, if one thinks about it, in our tempered system, there are at our disposal "only" twelve sounds (a few more if we consider the enharmonic). It is as verbally communicating with someone who possesses a vocabulary of only twelve words!

So, all the meaning resides mainly in the way by which we pronounce those words. Therefore, musical dialogue can arise only where the people are exercised in pronouncing the same word (or the same sound in this case) in dozens of different ways, as do actors who choose and practice a word with different emphasis using intonation, speed, colour. And this involves upstream work: the choice of meanings.

For this reason it has seemed helpful to use the parameter "dialogue" in the evaluation of occasional and consolidated duo, above all, referring to the choice of

meanings. In other words, according to Neuhaus[26] the most important is the specific artistic expression, the meaning, the content, and the poetic essence of music (Neuhaus, 1959).

6.4.4. Pilot study

Before proceeding with the completion of this study, a initial pilot study was carried out to design a protocol for data collection and test possible data analysis. A public concert was realized in January 2011, audio-video filmed, and afterwards analyzed. Since the DVD recording of the recital was accompanied by the minutes shown on the screen, it was possible to see the lowest and highest cardiac frequency (CF) and thus to calculate the average. Not only, this experience showed important and interesting possibilities "to see" when the musician had a higher or lower beat *per* minute (bpm) permitting to find an interesting way to observe the concert. This system with the overlap permitted to conclude very important considerations about, for example, the repertoire from the moments in which musicians were more physiologically stressed, the reactions to the mistakes, the visual contact, the body movements and so on.

Figure 22 shows two moments in the recital of pilot study, displaying a substancial difference in terms of heart rate of violinist between “during” (the left image) and “after” concert (the right image).

[26] Heinrich Neuhaus (1888-1964), Russian pianist and great teacher, famous for being the teacher of Sviatoslav Richter and Emil Gilels. Neuhaus believed that the cultural elements and mental execution were more important than the mere agility of the fingers. The piano technique presupposes, for Neuhaus, a musical vision and for that, the problems of pianist’s performance, must be faced to start from the music.

Figure 22. These two images represent two different moments of the pilot study. The left image shows bpm during the concert and the right, bpm just after the end of concert.

The subsequent analyses from the cardiology technician (CL) validated by cardiologist (JS), showed, not only the bpm, but also the changes in body posture measured by means of an accelerometer (acc). (See Figure 23).

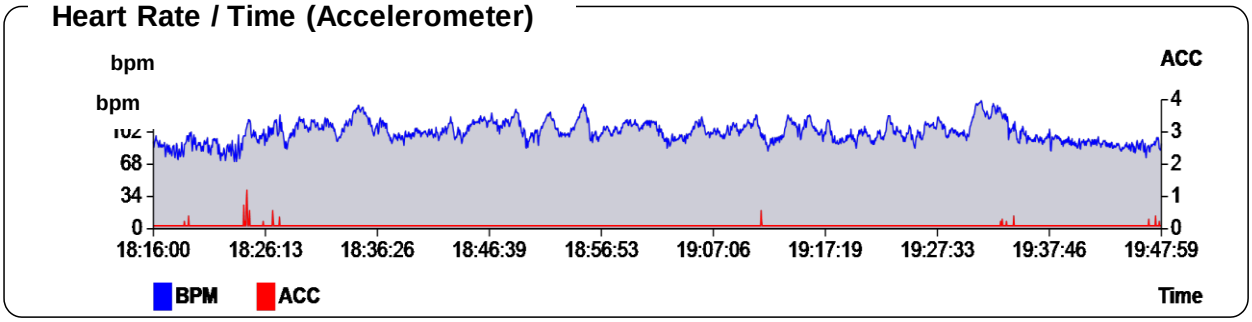


Figure 23. Example of heart rate and accelerometer graphic.

This figure above displays a comparison of heart rate and body posture changes during and after a public performance. It is quite clear that these parameters are higher for the moment of the performance as compared to the moment before or after.

6.4.5. Analyses of data

After collecting the data, they were entered into SPSS (Statistical Package for Social Sciences) for Windows 19, and analyzed that led to the formulation of conclusions. Given the characteristics of the sample (small number of participants) and the objectives to be

tested, it was decided to use non parametric statistics. Thus, in order to obtain information on the characteristics of the sample, descriptive statistics were calculated to psychological and physiological variables. Spearman correlations to study the relationships between the variables were also used.

Also noted is the significance level used of $p < .05$ as a reference.

6.4.6. Ethics approval

The whole study was presented to the violinists in order to explain what would be the implications of participating in this study. After all questions were answered and the participants felt content with the responses, they were asked to sign an informed consent form (see Appendix 1 and 3).

Different indications for ethical treatment of participants, including the Declaration of Helsinki (World Medical Association, 2000) and the American Psychological Association (APA, 2010) were taken into consideration.

Research safeguarded the welfare of the participants, above all. All research participants (violinists and interviewed) signed an informed consent to participate (see example in Appendix 1 and 3). In the first document the general objectives of the research, the role of the participants and the researcher role, including ensuring confidentiality of the data provided, were explained.

In the other document (Appendix 3) the participants give authorization for the collection of saliva samples for scientific purposes only. Only when the subjects understood the purpose of the investigation, the procedure to adopt and their role as participants, their collaboration was requested and formalized by the signing of informed consent. The participants received a duplicate of signed consent. It safeguarded the dignity, integrity, right to self-determination, privacy and confidentiality of personal data of the participants and was guaranteed the confidentiality of participants too. We defined the objectives of the research and collected only the information that would serve these goals and purposes of the investigation. It guaranteed that the results are accurate and objectively presented. The results of the investigation have been subsequently revealed to the participants during the experimental course and at its end.

PART III: RESULTS AND THE PIANIST'S PERSPECTIVE

CHAPTER 7: RESULTS

7. RESULTS

7.1. Psychological and Physiological dimensions – Individual results

As the author explained in the beginning of PART II, psychological and physiological markers were utilized in the present study. In this chapter, the results will be presented following the same order as used in the methods section, in the first instance observing the overall concerts. First, the entire results of the study tests − STAI; Cortisol; Heart rate − are presented in the following three Tables 7, 8 and 9 as a reference for the discussion to follow. The mean calculations are given with the Standard Deviation (SD) for each.

Table 7. Individual Mean and SD of STAI Y1 (before and after) of every musicians: P, V_1 and V_2. Venue A= University Concert Hall; Venue B= Secondary School Auditorium; WKnR = Well-known repertoire; RKnR = Recently known repertoire.

Variable Venue/ Repertoire	P STAI Y1 Before	P STAI Y1 After	V_1 STAI Y1 Before	V_1 STAI Y1 After	V_2 STAI Y1 Before	V_2 STAI Y1 After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
VA	38.2 ±2.7	35.7±2.9	51±5.6	32.5±2.1	28.5±4.9	22±1.4
VB	36±2.1	34±2.9	48.5±7.7	36.5±0.7	24.5±4.9	20.5±0.7
WKnR	37.2±2.6	34.2±0.9	47±5.6	34±4.2	23±2.8	20.5±0.7
RKnR	37±2.9	35.5±4.2	52.5±2.1	35±1.4	30±2.8	22±1.4
Overall Recitals	37.1±2.5	34.8±2.9	49.7±4.7	34.5±2.6	26.5±4.6	21.25±1.2

Table 8. Levels of Salivary Cortisol (µg/dL) inferred in all individual samplings for the P, V_1 and V_2. "A" = Start of recital; "B" = End of Recital; "C" = thirty minutes after the end of Recital.

Variable Venue/ Repertoire	P Cortisol "A"	P Cortisol "B"	P Cortisol "C"	V_1 Cortisol "A"	V_1 Cortisol "B"	V_1 Cortisol "C"	V_2 Cortisol "A"	V_2 Cortisol "B"	V_2 Cortisol "C"
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	0.175±0.084	0.129±0.059	0.111±0.074	0.190±0.004	0.278±0.070	0.198±0.060	0.148±0.027	0.196±0.054	0.184±0.066
VB	0.120±0.028	0.106±0.028	0.094±0.041	0.158±0.001	0.438±0.033	0.287±0.023	0.194±0.013	0.227±0.143	0.168±0.141
WKnR	0.157±0.091	0.126±0.057	0.109±0.067	0.173±0.021	0.345±0.165	0.213±0.081	0.157±0.039	0.281±0.066	0.249±0.026
RKnR	0.139±0.037	0.104±0.030	0.081±0.046	0.175±0.025	0.371±0.062	0.272±0.045	0.185±0.025	0.142±0.022	0.103±0.049
Overall Recitals	0.148±0.065	0.117±0.044	0.095±0.055	0.174±0.019	0.358±0.103	0.242±0.063	0.171±0.031	0.211±0.090	0.176±0.090

Table 9. Individual Mean and SD of heart rate (bpm), for A = before, B = during and C = after the concerts. P = Pianist; V_1 = Consolidated violinist and V_2 = Occasional violinist. VA= University Concert Hall; VB= Secondary School Auditorium. WKnR = Well-known Repertoire; RKnR = Recently known Repertoire.

Variable Venue/ Repertoire	P HR A	P HR B	P HR C	V_1 HR A	V_1 HR B	V_1 HR C	V_2 HR A	V_2 HR B	V_2 HR C
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	94±8.9	100±10.8	97±16.4	110±4.9	140±4.2	133±0.0	101±2.8	134±8.48	131±9.8
VB	102±9.4	114±12.0	99±16.09	111±3.5	144±0.2	129±14.8	102±0.7	131±12.3	125±19.0
WKnR	105±7.4	112±9.8	111±8.3	113±0.0	140±5.1	136±4.2	103±0.7	140±0.5	138±0.0
RKnR	92±5.3	102±14.7	86±6.8	107±1.4	144±1.1	126±10.6	100±1.4	125±4.4	118±9.1
Overall Recitals	98±8.9	107±12.78	98±15.11	110±3.6	142±3.5	131±9.0	101±1.7	133±8.9	128±12.9

7.1.1. Minnesota Multiphasic Personality Inventory (MMPI-2)

The total of thirteen scales in the MMPI-2 were measured. This test was carried out for the three musicians. The results for each factor can be transcribed qualitatively as a report. For this investigation, such a report on the results was done by a professional psychiatrist (FR) and psychologist (AT), for each of the duo members, as follows. The presentation of profile is more exhaustive for the pianist, as she is the common element in both duos and because the principal aim of the study is to try to understand the psychological and physiological response of the pianist, playing with a consolidated or a new partner.

From the analysis of these scales, the following profile, that is visible in Figure 24, for the pianist is concluded:

- The pianist has demonstrated an attitude in not speaking about personal preoccupations, rather takes some distance from them.
- The pianist has shown a basic capacity to derive from internal resources and put them in action effectively.
- Even when the things do not succeed, the pianist is willing and able to convert those experiences into positive learning, to invest in them in ulterior ways.

- Even when the pianist considers that some events can be problematic, the pianist demonstrates a capacity to accept vulnerability and to elaborate on it.

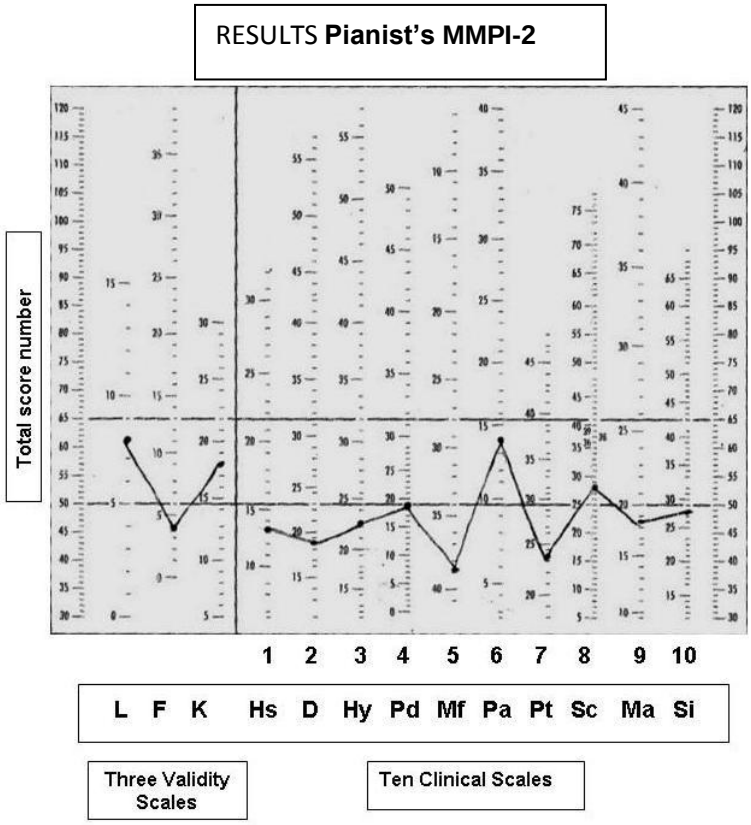


Figure 24. Pianist's MMPI-2 profile. The three validity scales are important to determine the validity of the test. The others ten clinical scales evaluate different aspects of personality that are the following: 1. Hypochondriasis; 2. Depression; 3. Hysteria; 4. Psychopathic Deviate; 5. Masculinity-Feminility; 6. Paranoia; 7. Psychasthenia; 8. Schizophrenia; 9. Hypomania; 10. Social Introversion.

- The pianist shows an attitude to satisfactory relationships, assertive in personal contents, without insisting on more than necessary. On the contrary, the pianist expresses plenty of cheerful feelings during the comparison with the other's way of life.
- As a collaborative person, the pianist gives significance to the other's teachings and examples. Likewise, in stressful situations, the pianist does not call for help.
- The pianist's inherent mood modulation creates the possibility to express large and deep emotional excursions.

- Some emotional states, some experiences and behaviours, even if increased in their expressions, are able to turn out a useful material. The pianist demonstrates furthermore this capacity to be able to systematize.

The graphs of the two violinists are not presented. Only the results in narrative form of MMPI-2, which are analysed by the certified psychiatrist (FR) and the certified psychologist (AT), are reported.

The violinist 1 (V_1) relates to the environment with mild interest and moderate involvement, within a basic attitude of reserve. He has not the propensity to externalise, rather shows adaptive rigidity. On the other side of the context, he proves to be respectful, revealing also confidence levels for those whom he believes to be competent and able to understand his internal dynamics. Thus, he does not disdain to give a glimpse of some parts of himself, for others to discover and enjoy. The attitude described above opens up, however, an overall willingness to allow himself to explore the context, especially the relational. The fact of realizing such transactions is made possible by appreciable levels of imagination and creativity, giving greater resourcefulness to work through visitation of his inner core and introspection. This is followed by an immediate personal enrichment, also for the conscious perception of finding, at least inside himself, content that can be used to push to reverse more demanding contexts. This introspective work makes it much easier to produce significant emotional movements; both face possible areas of vulnerability that could result from any disturbances, as, for example, the losses of attention / concentration or excessive focus on environmental overloads experienced as stressful. In conclusion, it should be reiterated how the subject is perceived to be involved in a journey of emotional growth, capable of helping him gain self-confidence and competence.

The violinist 2 (V_2) appears as tending to attribute relevant importance to the evaluations that others can formulate about him, to the extent that he lets himself be conditioned in some choices and behaviours. To not correspond to these expectations makes him feel inadequate or threatened by not achieving adequately. To disappoint others, then, assumes for him quite an unpleasant, if not in itself disturbing, meaning. In this form of generic frustration against himself, the subject cannot properly modulate the mode of relationship with others. It could be advantageous for the subject to learn to better visit his own emotional core. And also to store up larger introspective means, in order to experiment how his own internal resources can allow him the possibility of more enriching and less threatening knowledge. In this sense, the relief of the treatment of

distrust must also be read as linked to the perception of how the presence of the other could, in the subject, perturb his internal order. The perception that we have of everything described above is that such attitude and such dysfunctional production of avoidance behavior derives from threats mainly feared by the subject and not realistic in their supposed capabilities of danger.

The psychiatrist (FR) who accompanied the study summarized the personality traits of each of the three subjects. He categorized the three personalities of the musicians as:

(i) Pianist: creative, tenacious and deep, faithful (or reliable), and uncompromising.

(ii) Violinist 1: fanciful, indolent and respectful, serious, and discrete.

(iii) Violinist 2: self-controlled, renunciatory and avoiding, extrovert, and unpredictable.

7.1.2. Kenny Music Performance Anxiety Inventory (K-MPAI)

Being that the pianist (P) is the common element in both duos, it was decided to expand the study of her personality through the most recent test of MPA. This test was then analysed by a certified psychologist (AT). Using the Kenny Music Performance Inventory (Kenny, Ackermann & Driscoll, 2009) as the basis of an exploratory evaluation grouped by thematic factors, the fixed subject's values are presented in the following Table 10.

Table 10. Assessed factors in K-MPAI, results and average value of pianist.

Assessed Factors	Pianist Results	Average
Depression-hopelessness (psychological vulnerability)	-21	-2.33
Worry-dread (Negative cognitions)	-6	-1
Proximal somathic anxiety	-16	-2.29
Parental empathy	-8	-2.67
Memory	-4	-2
Pre and post performance ruminations	-1	-0.05
Generational transmission of anxiety	-9	-3
Self-other scrutiny	-2	-0.67

Controllability	-4	-2
Cost of opportunity	0	0
Confidence	0	0
Dispersed anxiety	1	1

Higher levels of anxiety are revealed when many high and positive values of the items are present. In this case, the pianist shows overall general negative values. This means that she is not an anxious person.

Although these values constitute only a reference, by using the original assessment tool and the corresponding factor structure, the subject does not show high levels of musical performance anxiety since there are negative results on most items and factors. These results indicate that P shows low levels of anxiety transmitted generationally (in an constitutional or innate or congenital way), in parental empathy, with psychological vulnerability and hopelessness or depression, in proximal somatic anxiety, controllability, memory and negative thoughts such as worry. Simultaneously, neutral levels are found in the following factors: self / and hetero / scrutiny; rumination before and after the performance, and confidence. The highest value is found in dispersed anxiety.

To know this profile it is important because the study wants to find differences in the psycho-physiological response of the pianist playing with two different partners. The information about the anxiety profile of the pianist in performance shows us that she has, in general, low levels of MPA. So, the eventual differences found in the pianist in the other tests will be attributed to other factors (venue, repertoire, partner).

7.1.3. Clinical Inventory of Self-Concept (ICAC – Portuguese Version)

The results of ICAC indeed showed that the three musicians are quite different in relations with the Self Concept. Thus, it is not difficult to come to a conclusion that the Self-Concept is correlated with the levels of anxiety that each person develops in different circumstances considering that the stage "amplifies" what we are in a social context. It is important to emphasize that the test talks about what the person thinks about her/himself, and it may not correspond to the reality. Therefore, the test shows only what the subject thinks and considers him/herself. The results of this test are displayed in Table 11.

Table 11. Total Score of ICAC of P, V_1 and V_2. F = Factor. F1: acceptance/ social avoidance; F2: self-effectiveness; F3: psychological maturity; F4: impulsiveness-activity.

Participants	Total Score	F1	F2	F3	F4
P	81	17	27	17	12
V_1	67	18	16	11	13
V_2	83	23	24	15	12

From Table 11, it is evident that the pianist possesses the highest scores for self-effectiveness (F2) and psychological maturity (F3) and the lowest on acceptance/social avoidance scores, as compared to both violinists. V_1 was the one presenting lowest scores for self-effectiveness and psychological maturity and V_2 was the one presenting the highest scores for acceptance/ social avoidance. All participants scored very similarly for impulsiveness-activity.

Recognising that self-concept can affect and influence the performance (Judge, Erez & Bono, 1998; Jackson *et al.*, 2001), this parameter is quite important to understand how the musicians involved in this study fit (or not) the normative data. The three musicians show to be all within the normative parameters. However, P shows to be "above" the average in relation to the factors F2 and F3, while V_2 is "above the norm" in terms of F1, V_1 shows to be “below” for the F2 (self-effectiveness) denoting a high level of self-criticism.

7.1.4. State-Trait Anxiety Inventory forms Y1 and Y2 all musicians - Overall

Table 12 presents the results of STAI-Y1 (also known as STAI-State). and STAI-Y2 (also known as STAI-Trait), for the three musicians before and after.

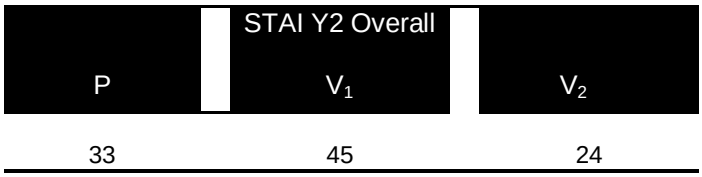
Table 12. Individual Mean and SD of STAI Y1 (before and after) of every musicians. P = Pianist; V_1 = Violinist 1 and V_2 = Violinist 2.

STAI Y1 Overall						
P			V_1		V_2	
Before	After		Before	After	Before	After
Mean±SD	Mean±SD		Mean±SD	Mean±SD	Mean±SD	Mean±SD
37.1±2.5	34.8±2.9		49.7±4.7	34.5±2.6	26.5±4.6	21.25±1.2

In general, the pianist shows smaller differences of anxiety levels between the measurements of STAI Y1 before and after the concerts. These differences in state anxiety between before and after concerts are more evident for V_1 than for V_2, although both have higher differences than the pianist.

Regard the STAI Y2 (state trait), Table 13 display the value obtained for the three musicians.

Table 13. Individual STAI Y2 (trait) of every musicians. P = Pianist; V_1 = Violinist 1 and V_2 = Violinist 2. Reference for Normal values for males = 45.68.



It is evident from the results of individual STAI Y1 (Table 12) and Y2 (Table 13), that the V_1 presents a higher mean value when compared with P and V_2, both for trait or state anxiety. In any case, the values obtained by the three musicians, rank in the normal anxiety levels. The only time a value well above normal was registered was in a state of anxiety for V_1 (being that the reference value for the male population is 45.68, stated by Silva & Campos (1998).

7.1.5 Cortisol all musicians - Overall

The results for the salivary cortisol levels in the participants of this study are summarized in Table 14. Time "A" corresponds to the moment just before the musicians were entering the stage. Time "B" corresponds to the end of the concert. Time "C" was measured 30 minutes after the end of the concert. It is relevant to know that cortisol values correspond not to the moment of its measurement, but to fifteen minutes before their measurement. Thus, "A" corresponds approximately to 6.15 p.m.; "B" corresponds approximately to 7.15 p.m., and "C" at 7.45 p.m. Start time for each concert was 6.30 p.m. Each ended approximately at 7.30 p.m.

Table 14 displays the value and SD of the salivary cortisol level for each musician at "A", "B" and "C", considering overall concerts.

Table 14. Levels of Salivary Cortisol (µg/dL) overall recitals inferred in all individual samplings for the P, V_1 and V_2. P = pianist; V_1 =Violinist 1; V_2 = Violinist 2. "A" = just before start the concert; "B" = just after the end of concert; "C" = thirty minutes after the end of concert.

Cortisol Overall								
P			V_1			V_2		
"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"
Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
0.148±0.065	0.117±0.044	0.095±0.055	0.174±0.019	0.358±0.103	0.242±0.063	0.171±0.031	0.211±0.090	0.176±0.090

It is possible to note that in the violinists there is an increase of concentrations levels of cortisol in moment "B" (measured "just after" the recitals but that corresponds to last fifteen minutes of recitals), while the pianist shows a constantly decrease from beginning to the end.

In order to create a baseline reading in which to compare the tests of the concert days, cortisol samplings were also analysed on two "normal days", meaning for "normal days", days on which the three musicians did not have a recital to accomplish. In the Table 15 below, average and SD are presented in normal days, more or less in the time interval similar to the concert.

Table 15. Levels of Salivary Cortisol (µg/dL) and SD in the normal days for the P, V_1 and V_2. P = pianist; V_1 =consolidated partner; V_2 = occasional partner. "A" = 5 pm; "B" = 7.30 pm; "C" = 9 pm. ND = Normal Days.

Cortisol Normal Days								
P ND			V_1 ND			V_2 ND		
"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"
Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
0.068±0.071	0.040±0.028	0.086±0.007	0.073±0.085	0.003±0.021	0.041±0.028	0.102±0.021	0.066±0.134	0.038±0.007

Observing and comparing the two Tables 14 and 15, it is clear that the situation of recital represents for all musician involved in the study, a stressful event. I. e., the cortisol concentrations it was clearly higher in the days of recitals.

In the pianist, it may be noted that in normal days the trend of cortisol concentrations does not correspond to the days of concerts looking, for example, from "B" to "C" (7.30 p.m. - more or less the time of the end of recitals) in ND when there is an increase of cortisol concentrations.

The consolidated violinist (V_1), contrary to what was observed for the pianist, presents in general the higher stress levels during the performance, at the time "B" (measured just after the end of the concert but that represents the last fifteen minutes of the recitals). Curiously, at "A" (before entering on stage), the V_1 presented his low value.

Observing almost the same time interval in ND (normal days) notes that the cortisol concentration trend is clearly opposite and, as for the others musicians of this study, also with lower scores.

Concerning $V_{2,}$ similarly to the V_1, he presents an increase in the concentration of cortisol in the time "B" in overall concerts while, in normal days, the trend is very similar with the pianist cortisol concentrations in performing days: a constant decrease.

All the cortisol data (kindly provided by biologist MJS) for the three musicians are given in the Appendix 6. In this appendix in general it is possible to identify the peak upon wakening that is normal. It is also possible to identify the daily cycle of cortisol during the days of the concerts, which show an increase shortly after waking up, visible in most samples. In the days of the concerts, another peak in cortisol is visible during the day. This peak corresponds to the time of performance. Statistical analysis confirmed a significant difference in salivary cortisol levels between normal days of the individuals and the day of the recital only for V_1. Other small peaks of cortisol are also noticeable in the table in Appendix 6, between 2 p.m. and 5 p.m. This may be due to the result of interference of food eaten taking into consideration the role of cortisol in digestion and formation of sugars (Salimetrics, 2010; Hucklebridge *et al.*, 1999) and also in the "prediction" of the stressor (the recital). It is noteworthy that the results are not statistically significant when compared individually.

To summarize, an increase of cortisol levels between the start and end times of the recitals is often visible for the violinist but not for the pianist. However, this difference is not statistically significant. Together, these three times ("A", "B" and "C") result in a peak of cortisol that is not observable during a normal day for any of the musicians in this study. However, this peak is not statistically significant in most of cases.

Nevertheless, there can be no doubt that the moment of the recital represents a moment of stress that can then have major effects and repercussions on the success of the performance. That includes the mental elaboration that goes into getting the concert prepared since we learn from our experiences and given the influence on the cognitive implications that cortisol can have.

In Appendix 6 there are also available the most relevant results according to the Bonferroni[27] post-test for this study.

7.1.6 Heart rate all musicians - Overall

The other physiological parameter used in this work is the measurement of the heart rate in beats per minute (bpm) for all musicians − before (A), during (B) and after (C) the performances − following the same methodological approach for data collection used for cortisol. To collect this data of the heart rate, periods from fifteen minutes before to fifteen minutes after each concert were analysed.

Table 16 presents a summary result overall, concerning the heart rate measured by means of a VitalJacket®, for all recitals of the study. No baseline was taken on normal days because of too many variables to control.

[27] Carlo Emilio Bonferroni (Bergamo, January 28, 1892 - Florence, August 18, 1960) was an Italian mathematician, best known for the inequalities that bear his name. Proposed inequalities were written about in his first article of 1935 that was devoted to applications for life insurance and in a more abstract second one in 1936. He was also interested in the foundations of probability theory, in his work he strongly supports a frequentist point of view, excluding that which can be considered subjectivist points of view in mathematical terms.

Table 16. Individual Mean and SD of heart rate (bpm), for A = before, B = during and C = after the concerts. P = Pianist; V_1 = consolidated partner and V_2 = occasional partner.

Heart rate Overall								
P			V_1			V_2		
A	B	C	A	B	C	A	B	C
Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
98±8.9	107±12.78	98±15.11	110±3.6	142±3.5	131±9.0	101±1.7	133±8.9	128±12.9

It is possible to note that all musicians had an increase of heart rate, more or less, during the recitals, time B. Comparing with cortisol value overall, one notes that for the violinists the trend corresponds to heart rate. For the pianist, one may observe that in heart rate she has an increase during the recital (B) while, as shown, she had a decrease in cortisol at time "B".

7.1.7 Summary of the first section of results

Figures 25, 26 and 27 resume this first section of the Overall concerts for the three musicians.

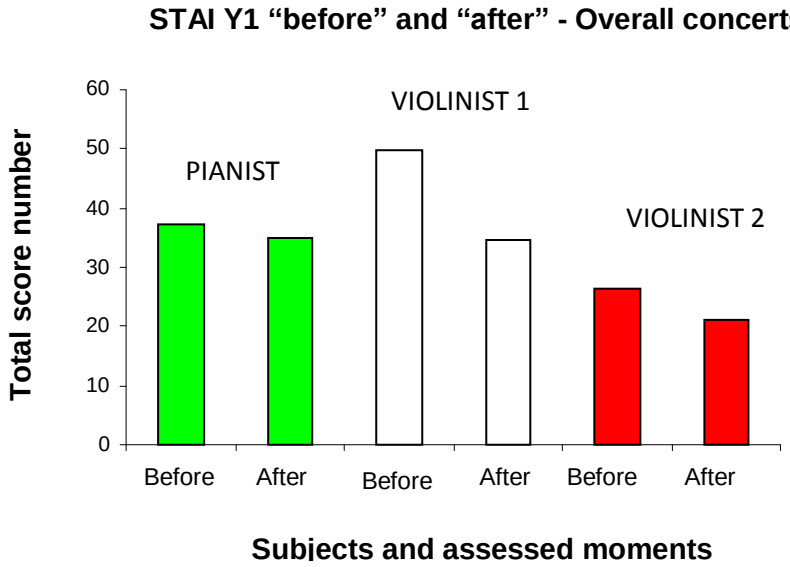


Figure 25. STAY Y1 before and after overall concerts for all musicians.

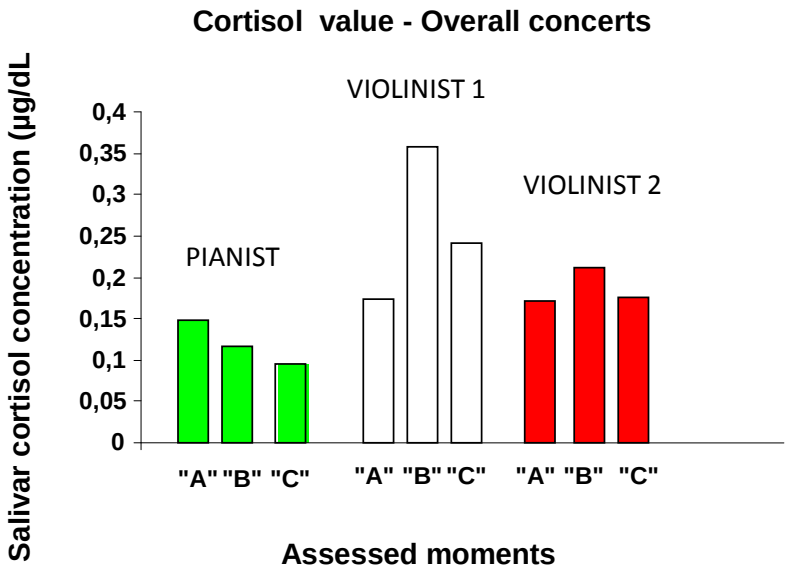


Figure 26. Cortisol overall concerts for all musicians. "A" = just before entering on stage; "B" = just after concert; "C" = half hour after concerts.

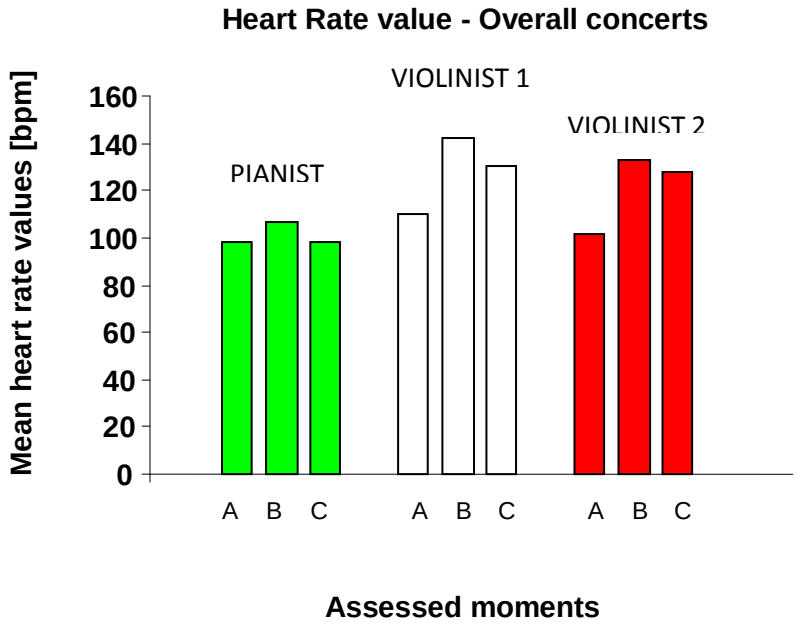


Figure 27. Heart rate overall concerts for all musicians from fifteen minutes before to fifteen minutes after concerts.

7.2. Psychological and Physiological dimension – Individual results in function of Venue

7.2.1. Individual State -Trait Anxiety Inventory overall (all musicians) – Venue

After the first major overview of the overall results, taking into count the variables of this study, the next section shows the individual results of the pianist and the violinists in function of Venue (Venue A = University Concert Hall; Venue B = Secondary School Auditorium) with respect to the STAI tests, cortisol samplings and heart rate measurement. Below Table 17 presents the individual results in terms of psychological response.

Table 17. Individual Mean and SD of STAI Y1 (before and after) of every musician, in function of Venue. VA= University Concert Hall; VB= Secondary School Auditorium. P = Pianist; V_1 = consolidated partner and V_2 = occasional partner.

Venue	STAI Y1 Overall					
	P		V_1		V_2	
	Before	After	Before	After	Before	After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
VA	38.2 ±2.7	35.7±2.9	51±5.6	32.5±2.1	28.5±4.9	22±1.4
VB	36±2.1	34±2.9	48.5±7.7	36.5±0.7	24.5±4.9	20.5±0.7

In the following Figure 28, the pianist shows a higher value in Venue A than in Venue B.

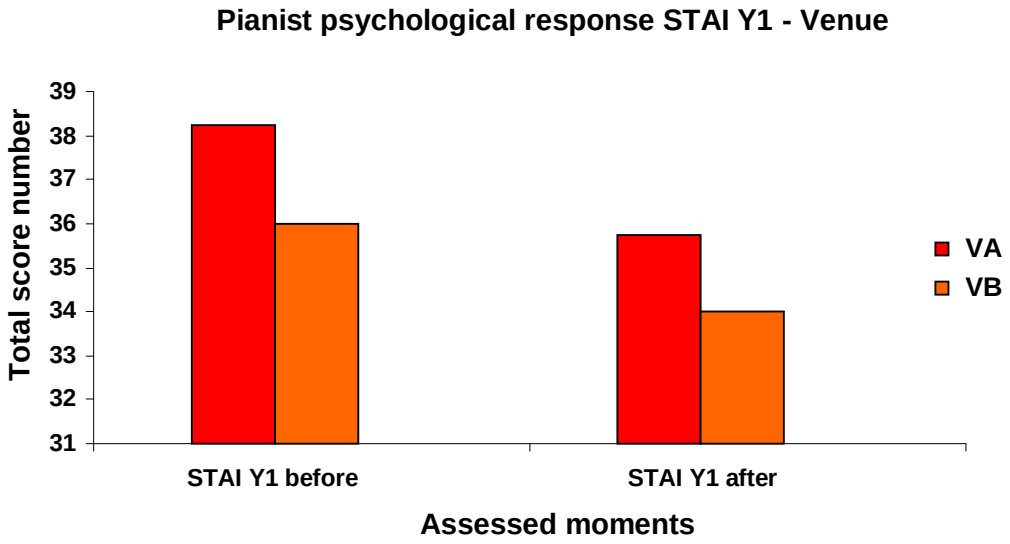


Figure 28. Psychological pianist's reaction (STAI Y1) regards to the venue. VA = University Concert Hall; VB = Secondary School.

Also the violinists, although with different numerical levels show a higher value in Venue A than in Venue B "before" the concerts. Observing the evolution of the state anxiety from the beginning to the end of the concert, the results clearly indicate that the anxiety level decreased from the beginning to the end of the performance in all musicians, more markedly in V_1, but also in P and V_2.

7.2.2. Individual Cortisol overall (all musicians) – Venue

Considering the physiological parameter of cortisol, the following Table 18, show the values for pianist and violinists regard to different Venues: a University Concert Hall (VA) and a Secondary School Auditorium (VB).

Table 18. Mean of Levels of Salivary Cortisol (µg/dL) inferred in all individual samplings for the P, V_1 and V_2. "A" = just before start the concert; "B" = just after the end of concert; "C" = thirty minutes after the end of concert.

Mean Cortisol Overall									
Venue	P			V_1			V_2		
	"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	0.175±0.084	0.129±0.059	0.111±0.074	0.190±0.004	0.278±0.070	0.198±0.060	0.148±0.027	0.196±0.054	0.184±0.066
VB	0.120±0.028	0.106±0.028	0.094±0.041	0.158±0.001	0.438±0.033	0.287±0.023	0.194±0.013	0.227±0.143	0.168±0.141

In relation to the Venue, the three musicians have very different reactions amongst them. The pianist always shows higher concentrations of cortisol in the Venue A. The V1 has higher values in the Venue A at the time "A" (= just before entering on the stage) but then presents higher values, in the moments "B" and "C" in Venue B. About the time, the violinist V2 "A" and "B" are the highest in the Venue B as the time "C" shows the highest values in the Venue A. In general, these data confirm the overall trend: an increase for V1 and V2 from before to after concert. On the contrary, the pianist had a constant decrease (Figure 29).

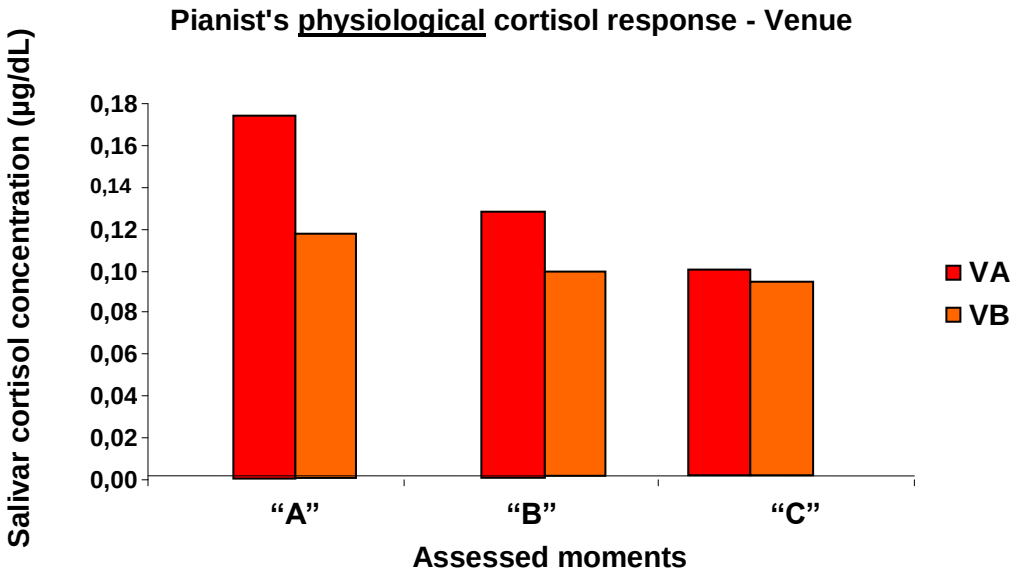


Figure 29. Physiological pianist's reaction (cortisol) regards to the venue. VA = University concert hall; VB= Secondary school; "A" = just before concert; "B" = just after concert; "C" = thirty minutes after concert.

7.2.3. Heart Rate overall (all musicians) – Venue

In function of Venue, Table 19 displays the results for the pianist and violinists in terms of heart rate.

Table 19. Individual Mean and SD of heart rate (bpm), for A = before, B = during and C = after the concerts. P = Pianist; V_1 = consolidated partner and V_2 = occasional partner; VA= University Concert Hall; VB= Secondary School Auditorium.

Heart rate Overall									
Venue	P			V_1			V_2		
	A	B	C	A	B	C	C	B	C
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	94±8.9	100±10.8	97±16.4	110±4.9	140±4.2	133±0.0	101±2.8	134±8.48	131±9.8
VB	102±9.4	114±12.0	99±16.09	111±3.5	144±0.2	129±14.8	102±0.7	131±12.3	125±19.0

In terms of the cardiac frequency, there are not to be detected major differences in the reactions of the three musicians as a function of Venue. The values are very close to each other and therefore not relevant or indicative of any specific aspect. It is possible to observe always an increase from before (A) to during (B) the recitals. However the values of the pianist are always slightly higher in the B Venue (Figure 30 below).

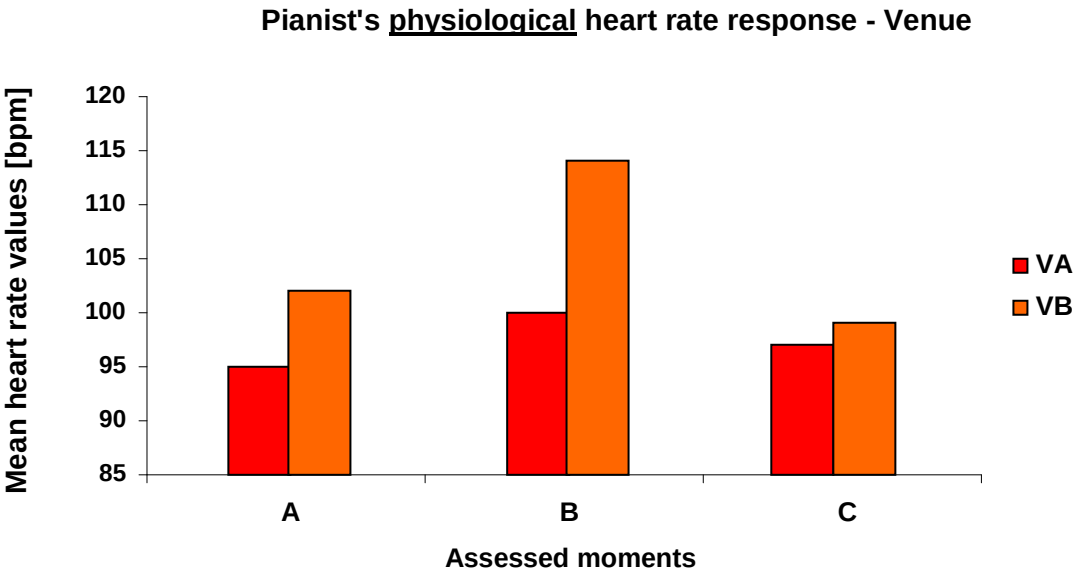


Figure 30. Physiological pianist's reaction (heart rate) regards to the venue. VA = University concert hall; VB= Secondary school; A = before concerts; B = during concerts; C = after concerts.

7.3. Psychological and Physiological dimension – Individual results in function of Repertoire

7.3.1. State -Trait Anxiety Inventory overall (all musicians) - Repertoire

The data here presented compare the psycho-physiological results in function of repertoire. It is important to emphasize that the differentiation from WKnR and RKnR did not exist for V_2, the occasional violinist partner. In this way, this parameter is important only for the members of consolidated duo, pianist and V_1. Table 20 diplays individual results overall concerts.

Table 20. Individual Mean and SD of STAI Y1 (before and after) of every musician, in function of Repertoire. WKnR = Well-known Repertoire; RKnR = Recently known Repertoire. P = Pianist; V_1 = consolidated partner and V_2 = occasional partner.

Repertoire	STAI Y1 Overall					
	P		V_1		V_2	
	Before	After	Before	After	Before	After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
WKnR	37.2±2.6	34.2±0.9	47±5.6	34±4.2	23±2.8	20.5±0.7
RKnR	37±2.9	35.5±4.2	52.5±2.1	35±1.4	30±2.8	22±1.4

With respect to repertoire, the pianist shows more or less the same value, with WKnR being slightly higher before the concert. After the concert, the state anxiety was higher in RKnR (Figure 31). The two violinists, although with lower numerical levels, present both evidently higher values in RKnR.

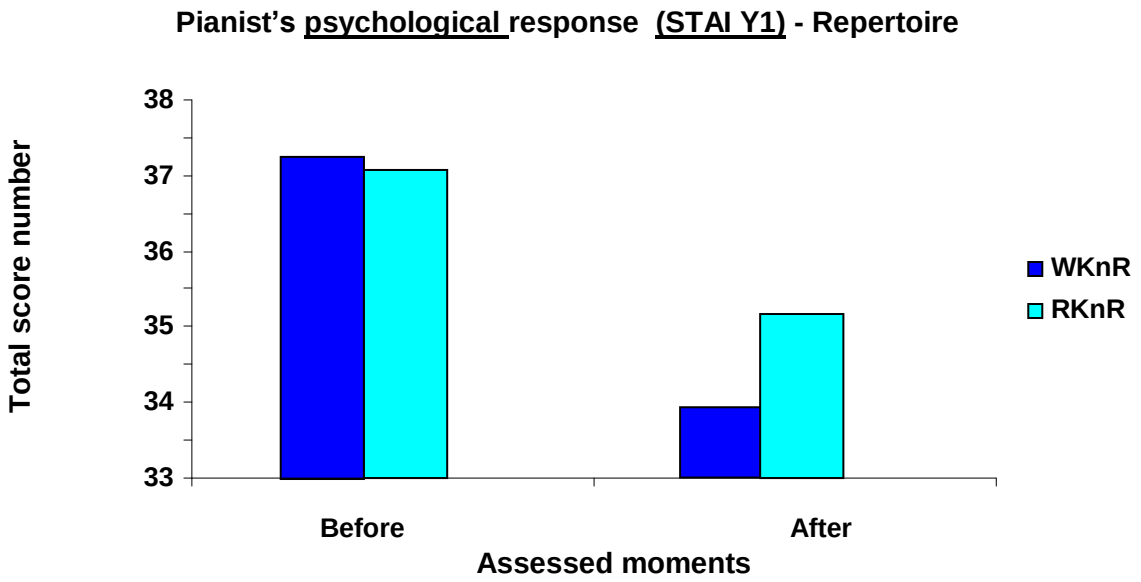


Figure 31. Psychological pianist's reaction (STAI Y1) regards to the repertoire. WKnR= Well-known repertoire; RKnR = Recently known repertoire; Before = STAI Y1 before the concert; After = STAI Y1 after the concert.

7.3.2. Cortisol overall (all musicians) – Repertoire

Concerning cortisol levels concentrations regard repertoire, Table 21 displays the value obtained for the three musicians.

Table 21. Levels of Salivary Cortisol (µg/dL) inferred in all individual samplings for the P = Pianist, V_1= consolidated partner and V_2 = occasional partner; WKnR = Well-known Repertoire; RKnR = Recently known Repertoire.

Mean Cortisol Overall									
	P			V_1			V_2		
Repertoire	"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
WKnR	0.177±0.085	0.200±0.122	0.151±0.031	0,173±0.021	0,375±0.122	0,213±0.081	0,167±0.039	0,157±0.066	0,137±0.026
RKnR	0.139±0.037	0.104±0.030	0.081±0.06	0,175±0.025	0,371±0.062	0,303±0.045	0,203±0.023	0,126±0.060	0,068±0.076

For the pianist, the WKnR offers higher stress levels than the RKnR and one notes in WKnR an increase of cortisol concentrations from "A" to "B while, in RKnR, the trend is completely different: a gradual decrease (Figure 32).

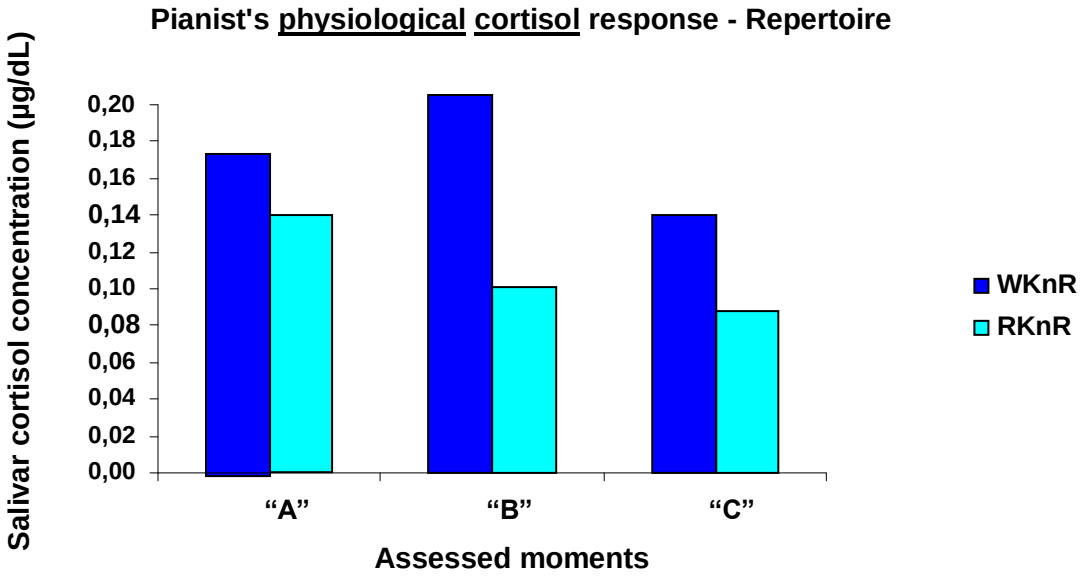


Figure 32. Physiological pianist's reaction (cortisol) regards to the repertoire. V_1 = consolidated partner; V_2 = occasional partner. "A" = just before concert; "B" = just after concert; "C" = thirty minutes after concert.

For the V_1, the repertoire is not a marker of concentrations of cortisol: i.e. the score are very similar in WKnR and RKnR and he has an increase from time "A" to "B" (as the pianist).

For V_2, one notes in general a decrease from time "A" to "B" in both repertoires. However, in the moment "A" the high score is in RKnR, while in the moment "B" and "C" the value are higher in WKnR.

7.3.3. Individual Heart rate overall – Repertoire

7.3.3.1. Well-known and Recently known Repertoire

To compare individual response in terms of cardiac frequency, Table 22 displays the results of the three musicians.

Table 22. Individual Mean and SD of heart rate (bpm), for A = before, B = during and C = after the concerts. P = Pianist; $V_{1=}$ consolidated partner and V_2 = occasional partner. WKnR = Well-known Repertoire; RKnR = Recently known Repertoire.

Heart rate Overall									
Repertoire	P			V_1			V_2		
	A	B	C	A	B	C	C	B	C
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
WKnR	105±7.42	112±9.86	111±8.34	113±0.00	140±5.13	136±4.24	103±0.71	140±0.53	138±0.00
RKnR	92±5.5	102±14.77	86±6.85	107±1.41	144±1.06	126±10.61	100±1.41	126±4.42	118±9.19

One can observe a rather constant heart rate across the performances for all musicians (sometime slightly, sometimes more consistent). Although the differences for the pianist are very slightly, the WKnR is the condition involving a higher heart rate.

Figure 33 shows the pianist's response in graphic form.

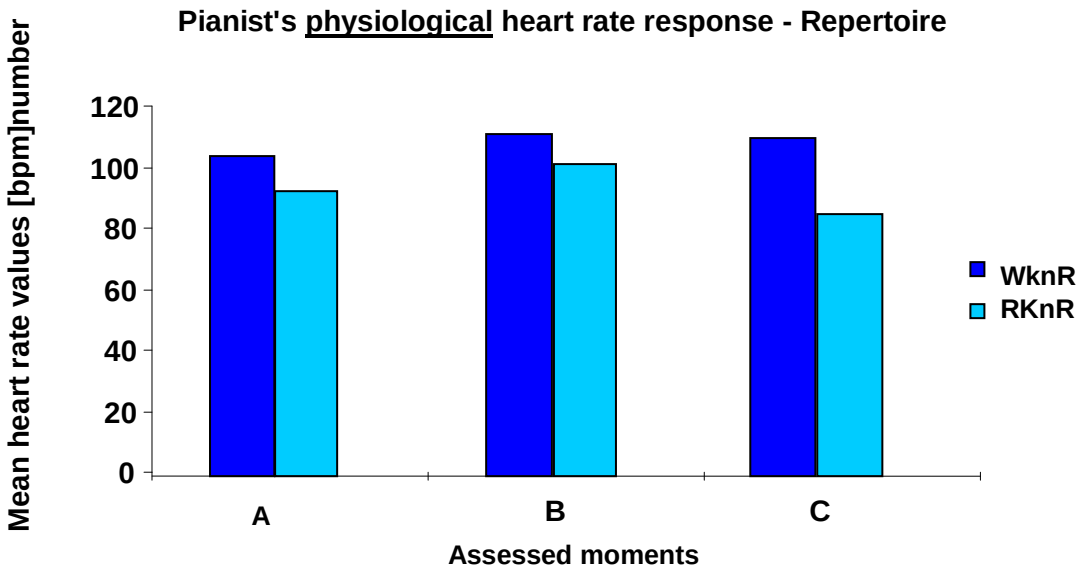


Figure 33. Physiological pianist's reaction (heart rate) regards to the repertoire. VA = University concert hall; VB= Secondary school; A = before concerts; B = during concerts; C = after concerts.

7.3.3.2. Comparing Well-known Repertoire and Never Rehearsed pieces

In order to understand if a specific piece of repertoire determined a difference in heart rate value, the time period relative to specific pieces is analysed. The interest was therefore concentrated on the constant piece (Mozart sonata in B flat, K. 378) and the pieces that were "never rehearsed" (NRp) before concerts. The following three graphics (Figures 34, 35 and 36), one for each musician, show the differences in HR compared to above mentioned pieces.

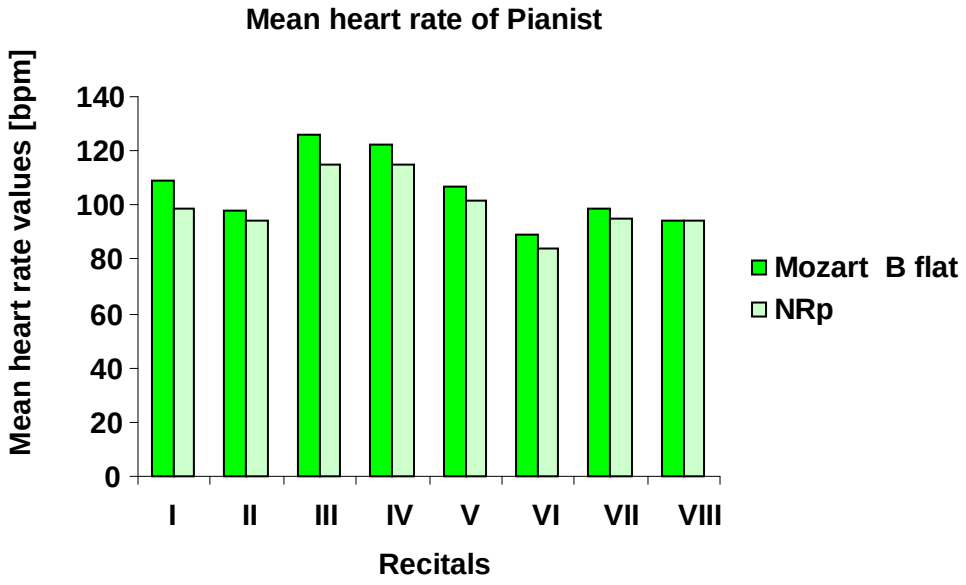


Figure 34. Pianist's mean heart rate value in the constant piece (Mozart) and NRp = Never Rehearsed pieces.

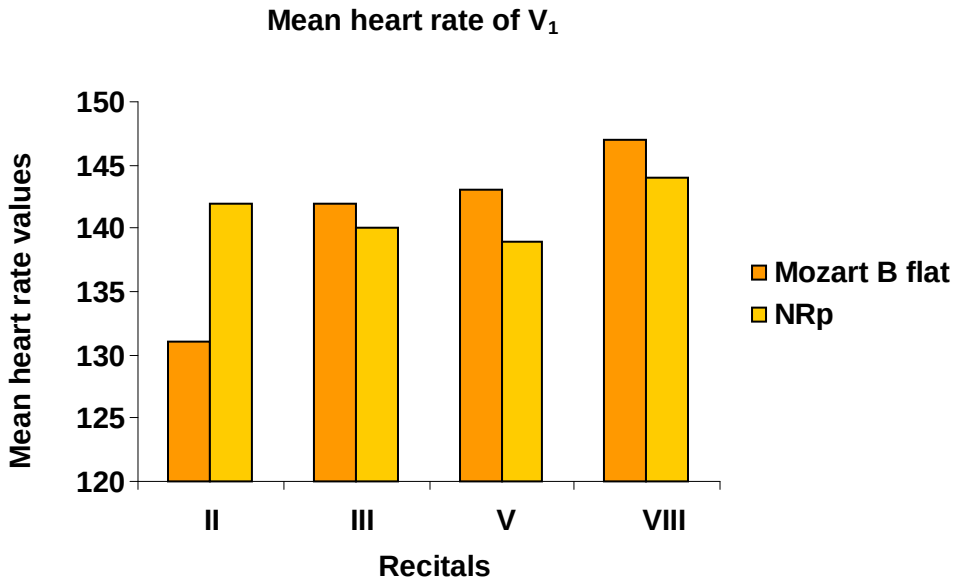


Figure 35. Mean heart rate value of V_1 in the constant piece (Mozart) and NRp = Never Rehearsed pieces. V_1 = consolidated partner.

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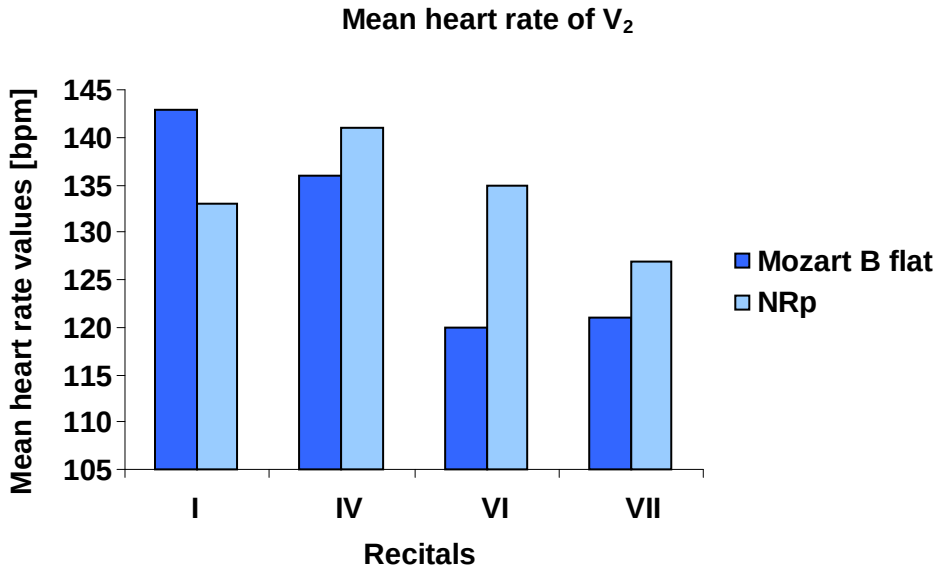

Figure 36. Mean heart rate value of V_2 in the constant piece (Mozart) and NRp = Never Rehearsed pieces. $V_{2=}$ occasional partner.

As it is possible to see in these three graphics above, in terms of heart rate, the "old" repertoire (Mozart, K. 378) was always the more stressful element for P and V_1 with the exception of V_1 in the first concert.

7.3.4. Summary

To resume, the **Overall** results of pianist and violinists were (Tables 7, 8 and 9):

- **PIANIST**

(i) The pianist shows higher state anxiety scores before concerts.
(ii) Cortisol level concentrations decrease always from the beginning to the end of recitals.
(iii) Heart Rate does not "accompany" the cortisol reaction, showing always a slightly increase from the before to during recitals.

- **VIOLINIST $_1$**

(i) He shows higher state anxiety scores before concerts.
(ii) Cortisol level concentrations increase always from the beginning to the moment "B" (during) of recitals.
(iii) Heart Rate "accompanies" the cortisol reaction, showing always an increase from A (after) to B (during) the recitals.

- **VIOLINIST $_2$**

(i) He shows higher state anxiety scores before concerts.
(ii) Cortisol level concentrations increase always from the beginning to the moment "B" (during) of recitals.
(iii) Heart Rate "accompanies" the cortisol reaction, showing always an increase from A (after) to B (during) the recitals.

Concerning Venue:

- **PIANIST**

(i) The pianist shows higher state anxiety scores in Venue A before and after concerts.
(ii) Cortisol level concentrations are always higher in Venue A.
(iii) Heart Rate is almost the same in both Venues but it was slightly higher in Venue B.

- **VIOLINIST $_1$**

(i) He shows higher state anxiety scores in Venue A before and Venue B after concerts.

(ii) Cortisol level concentration was higher in Venue A in moment “A” (before concerts) and in Venue B in moments “B” and “C” (during and after).

(iii) He shows the same mean in both venues: in fact the difference was absolutely irrelevant.

- **VIOLINIST $_2$**

(i) He shows higher state anxiety scores in Venue A

(ii) A cortisol level concentration was higher in Venue B in moment “A” (before) and “B” (during) while in moment “C” was higher in Venue A.

(iii) He shows the same mean in both venues: in fact the difference was absolutely irrelevant.

Concerning Repertoire

- **PIANIST**

(i) The scores of state anxiety were the same in WKnR and RKnR.

(ii) Cortisol level concentration was higher in WKnR.

(iii) Hear rate score was higher in WKnR.

- **VIOLINIST $_1$**

(i) He shows higher state anxiety scores in RKnR before and in WKnR after concerts.

(ii) Cortisol level concentration was almost the same in both repertoires.

(iii) Heart rate was almost the same mean in both repertoires.

- **VIOLINIST $_2$**

(i) He shows higher state anxiety scores in RKnR before and in WKnR after concerts.

(ii) A cortisol level concentration was higher in RKnR in moment “A” (before), while in “B” (during) and “C” was higher in WKnR.

(iii) He shows higher value in RKnR before concerts and in WKnR during and after.

In general, considering overall concerts all musicians were all more anxious before playing. About cortisol levels, the pianist showed a decrease during recitals when V_1 and V_2 showed an increase. Concerning heart rate, all musicians had shown an increase during the recitals comparing the before and after moments.

Concerning venue, the anxiety and the heart rate of all musicians were higher in VA (university), although the differences in heart rate were almost inexistent. Concerning the cortisol tests, many different reactions were found.

About the repertoire, the pianist had shown higher values of anxiety and stress when playing WKnR. The violinists showed higher values of anxiety, at the "before" moment playing RKnR and at "after" moment when playing WKnR. V_1 showed similar values in cortisol and heart rate while playing both types of repertoire. The V_2 showed the same reaction for himself in cortisol and heart rate: higher "before" in RKnR and higher "during" and "after" concert in WKnR.

After analyzing the individual data of psychological and physiological tests (STAI, cortisol, and heart rate), a test of Spearman correlation[28] of the data was made.

Pianist

The test used data of each musician individually.

With regard to the pianist, there was a significant relationship between cortisol "B" and HR B, $r_S = .75$, $p < .05$. There was also a significant relationship between cortisol "B" and HR C, $r_S = .79$, $p < .05$.

[28] In statistics, Spearman's rank correlation coefficient or Spearman's rho, named after Charles Spearman and often denoted by the Greek letter ρ (rho) or as r_s, is a nonparametric measure of statistical dependence between two variables.

In relation to the Venue A, there was found a statistically significant correlation between cortisol “B” and Heart rate B $r_S = 1$, $p < .000$.

Regarding Venue B, there was found a statistically significant correlation between cortisol “A” and state anxiety C $r_S = 1$, $p < .000$.

In relation to WKnR, there was found a statistically significant correlation between cortisol “C” e Heart rate C $r_S = 1$, $p < .000$.

Finally, regarding RKnR, all states of state anxiety after the concerts have a positive and statistically significant correlation with elevated cortisol levels “A”, “B” e “C”.

Violinist 1

In the overall concerts, V_1 has a statistically significant correlation between cortisol "B" and state anxiety after $r_S = 1$, p <.000.

We found a statistically significant negative association between differences from the end to the beginning (“C” – “A”) of cortisol with the initial heart rate (HR, moment A).

There are not have enough values to calculate associations between the levels of the variables studied (venue and repertoire).

Violinist 2

The differences in HR (C-A) are positively related to cortisol "B" and "C" $r_S = .1$, p <.000. The difference of cortisol (C-A) with Heart rate in moment B $r_S = 1$, p <0:00.

As with V_1, there are not have enough values to calculate associations between the levels of the variables studied (venue and repertoire).

7.4. Duo results

In this section, the results of the Consolidated Duo (CDuo) and the Occasional Duo (ODuo) are given. Since there is already calculated the mean for the overall recitals, only this variable is taken into consideration. The order follows that of the other sections: Psychological Tests, Cortisol readings, and Heart Rate monitoring. Thus, a duo profile is established for each duo by looking at the overall recital results.

7.4.1. Duo profile / psychological tests – Overall Recitals

For this calculation, the following formula was used:

- **CDuo = P STAY results + V_1 STAY results / 2**

  and

- **ODuo = P STAY results + V_2 STAY results / 2**.

Table 23 shows the results of psychological test STAI Y1 before and after for each Duo.

Table 23. STAY 1 before and after concerts in Overall Recitals. CDuo = consolidated duo; ODuo = occasional duo.

Type of Duo	Before	After
CDuo	43.4	34.65
ODuo	31.8	28.025 = 28.03

In both situations − before and after – concerts, CDuo was the most anxious. In order to find the percentage of anxiety, the percentage of ODuo is divided by CDuo. Thus, before concerts, CDuo is 27% more anxious than ODuo (100 - 73.27 = .27), while after concerts CDuo is nearly 20% more anxious (100 - 80.89 = .1911).

7.4.2. Duo results of Cortisol – Overall Recitals

This section now will consider the results of the same physiological tests when applied to the ensemble configuration of this study, taking into account the Overall Concerts of each Duo: the CDuo and the ODuo.

The formula used is:

- **CDuo = P Cortisol results + V_1 Cortisol results / 2**

  and

- **ODuo = P Cortisol results + V_2 Cortisol results / 2**.

Table 24. Duo Cortisol averages in Overall Recitals. "A" = just before concerts; "B" = just after concerts; "C" = thirty minutes after concerts. CDuo = consolidated duo; ODuo = occasional duo.

Type of Duo	"A"	"B"	"C"
CDuo	.161	.2375 = .238	.1685 = .169
ODuo	.1595 =.160	.164	.1355 = 136

Before the concerts, in "A", there was little difference between the Duos. However, the high value for ODuo during performance was very close to the low values of CD both before and after the concerts. The stress level measured by cortisol of ODuo during performance is 69% of that of CDuo, clearly showing that CDuo is the more stressed of the two Duos by 31%.

7.4.3. Duo results of Heart rate – Overall Recitals

In a similar manner, the Duo results of Heart Rate in the Overall Recitals is calculated.

The formula used is:

- **CDuo = P Heart rate results + V_1 Heart rate results / 2**

  and

- **ODuo = P Heart rate results + V_2 Heart rate results / 2**.

Table 25 diplays the results of Heart rate of consolidated and occasional duo.

Table 25. Duo Heart rate averages in Overall Recitals. A = before; B = during; C = after concerts. CDuo = consolidated duo; ODuo = occasional duo.

Type of Duo	A	B	C
CDuo	104	124.5= 125	114.5= 115
ODuo	99.5 = 100	120	113

It is clear that once again the CDuo is the most stressed in the Overall Recitals, during all three moments of performance, even. During the recitals ("B"), the CDuo stress is 4% more than ODuo's.

To conclude, in all three tests, the profile of CDuo is revealed to be more anxious and stressed than ODuo. This finding is confirmed before and after concerts, in all Venues and Repertoires.

7.5. The pianist in Duo

After understanding the behaviours for individual participants and Duos, it is now time to focus on the main question of this study: the effects of changing partner in performance for the pianist, the pianist being the central element of this study. One way of realizing that is to observe the state anxiety and the stress levels of the pianist, the common element for both duos, while playing with V_1 and V_2. In the first instance, overall concerts are looked at and then observations regarding venue and repertoire follow.

Keeping the same structure for the presentation of individual results, this section will be divided as follows:

a) Pianist playing with V_1 and V_2 – Partner

- STAI (Before and After)
- Cortisol ("A", "B" and "C")
- Heart rate (A, B and C)

b) Pianist playing with V_1 and V_2 -Venue

- STAI (Before and After)
- Cortisol ("A", "B" and "C")
- Heart rate (A, B and C)

c) Pianist playing with V_1 and V_2 - Repertoire

- STAI (Before and After)

- Cortisol ("A", "B" and "C")
- Heart rate (A, B and C)

7.5.1. The Pianist's state anxiety and physiological stress playing with V_1 and V_2 – Partners

The following Table 26 (and Figure 37) displays the mean values and SD of state anxiety before and after the concerts for the pianist when she playing with V_1 and V_2. It is evident that state anxiety levels are always higher when performing with V_1 (PV_1).

Table 26. Overall mean and SD Pianist playing with V_1 and V_2 of STAI Y1 (before and after). PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2 (occasional partner).

STAI Y1 Overall				
Partner	PV_1		PV_2	
	Before	After	Before	After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
	39±2.16	36.5±2.64	35.25±1.25	33.25±2.36

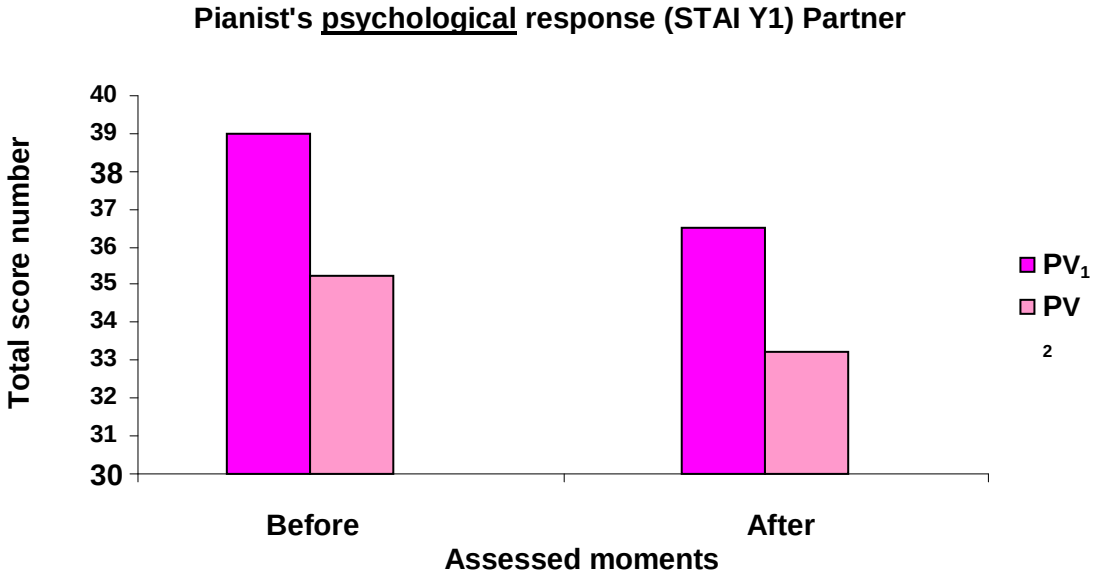

Figure 37. Psychological pianist's reaction (STAI Y1) regards to the partner. PV_1 = pianist playing with V_1 (consolidated partner); PV_2 = pianist playing with V_2 (occasional partner). Before = before the concert; After = after the concert.

Concerning the physiological response in terms of cortisol, the following Table 27 (and Figure 38) shows that in playing with V_1 the pianist had a slightly increase of cortisol concentration in "B" (during the concerts). On the contrary, while playing with V_2, the pianist had a gradual decrease of cortisol levels from the beginning to the end of concerts. It is interesting to note that looking for individual results, overall, the pianist has shown a constant decrease. But here, playing with V_1, it is evident that the trend of the pianist synchronizes relative to the individual cortisol of V_1.

Table 27. Mean and SD salivary cortisol level (µg/dL) overall recitals of the Pianist playing with V_1 and with V_2. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). "A" = just before start the concert; "B" = just after the end of concert; "C" = thirty minutes after the end of concert.

Cortisol Overall					
Partner	PV_1		PV_2		
"A"	"B"	"C"	"A"	"B"	"C"
Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
0.136±0.037	0.146±0.024	0.094±0.064	0.180±0.090	0.125±0.062	0.096±0.56

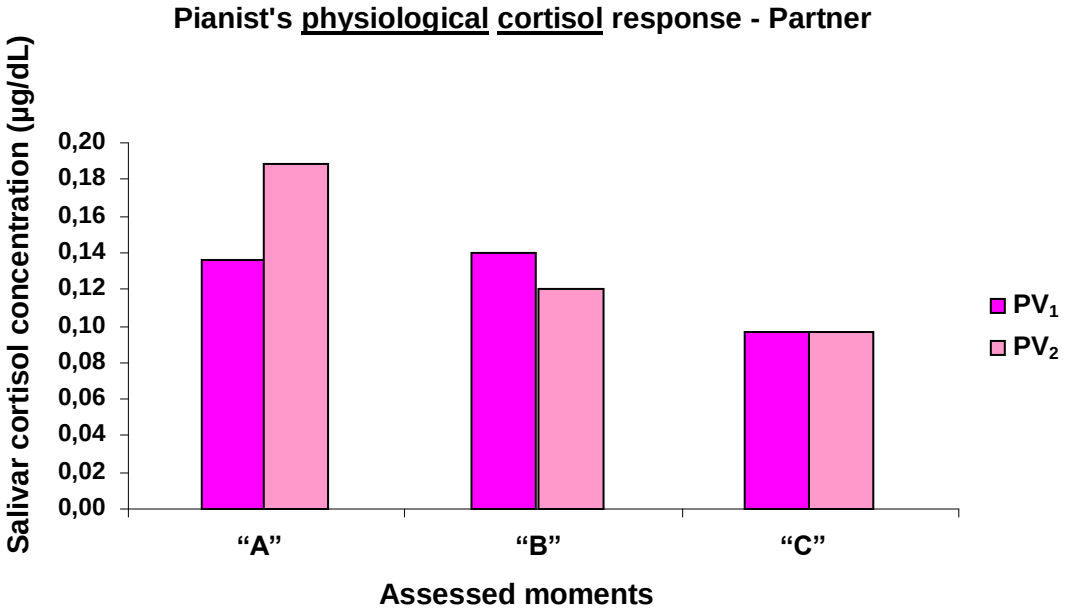

Figure 38. Physiological pianist's reaction (cortisol) regards to the partner. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). "A" = just before concert; "B" = just after concert; "C" = thirty minutes after concert.

Observing the heart rate evolution one notes that the pianist presented approximately the same value at the moments "before" and "after" the concerts while playing with PV_1 and PV_2 (Table 28). However, "during" the concerts, the higher values were found with V_1. Again, the pianist, while performing with V_1 (consolidated partner), had the highest markers in terms of anxiety and stress.

Table 28. Mean and SD of heart rate (bpm) overall recitals of the Pianist playing with V_1 and with V_2. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). A = before, B = during and C = after the concerts.

Heart rate Overall					
Partner	PV_1		PV_2		
A	B	C	A	B	C
Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
98±5.07	111±10.84	98±13.30	99±12.68	103±14.80	99±18.86

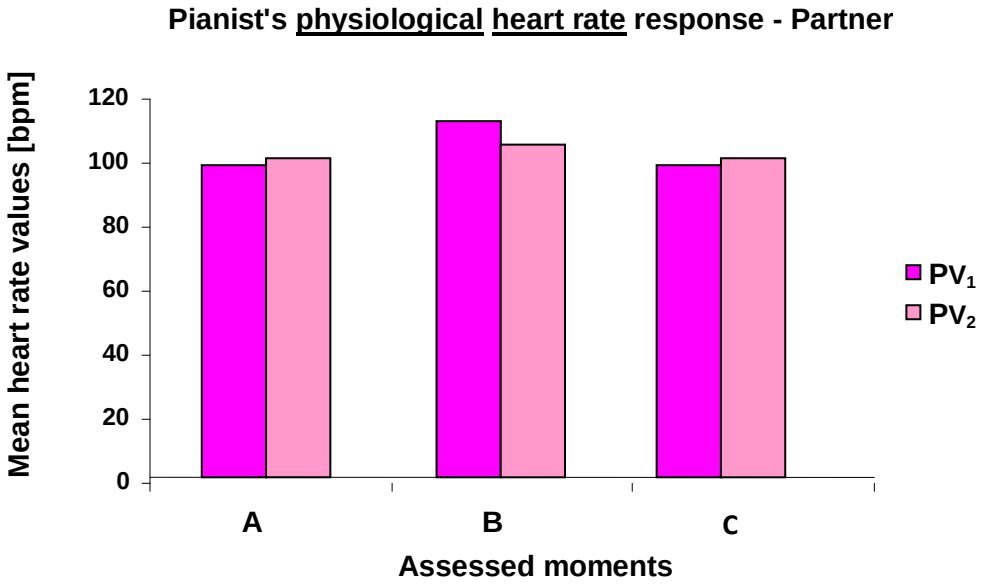

Figure 39. Physiological pianist's reaction (heart rate) regards to the partner. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). A = before concert; B = during concert; C = after concert.

In the figures and graphics above presented it is possible to summarize clearly that, with regards to partner, in the psychological and physiological parameters, the pianist was more stressed and anxious always with V_1, although in some cases the differences are minimal or nonexistent.

7.5.2. Pianist playing with V_1 and V_2 - Overall Venue

In order to understand which factor of the three considered here (Partner, Venue and Repertoire), represented the more evident marker in psychological and physiological response for the pianist playing with two different violinists. The next step was to evaluate STAI, Cortisol and Heart rate in function of Venue. The Table 29 shows that the pianist presents higher values in terms of anxiety when playing in Venue A (University). Between PV_1 and PV_2, it is evident that the pianist is more anxious playing with the consolidated partner.

Table 29. Mean and SD of STAI Y1 (before and after) of pianist playing with V_1 and V_2 in function of Venue. VA= University Concert Hall; VB= Secondary School Auditorium. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner).

Venue	STAI Y 1 Overall			
	PV_1		PV_2	
	Before	After	Before	After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
VA	40.5±4.24	37.5±3.54	36±1.41	34±1.41
VB	37.5±2.12	35.5±2.12	34.5±0.71	32.5±3.54

Considering cortisol reactions of the pianist in the two different duo configurations, Table 30 shows that the pianist had the higher values of cortisol while playing with the consolidated partner (V_1) in Venue B (Secondary school), especially showing an increase from moment "A" to "B". The trend is exactly the contrary in Venue A (University): a decrease from "A" to "B".

With respect to the occasional partner, V_2, the pianist had a constant decrease of cortisol concentration from "A" to "C" in both Venues but showing a higher score in Venue A.

Table 30. Mean and SD of pianist's levels of salivary cortisol (µg/dL) inferred playing with different partner, in function on Venue. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). "A" = just before start the concert; "B" = just after the end of concert; "C" = thirty minutes after the end of concert.

Venue	Cortisol Overall					
	PV_1			PV_2		
	"A"	"B"	"C"	"A"	"B"	"C"
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	0.141±0.051	0.113±0.033	0.145±0.004	0.210±0.118	0.145±0.091	0.110±0.082
VB	0.172±0.020	0.246±0.172	0.126±0.078	0.109±0.021	0.106±0.042	0.082±0.043

Considering the heart rate in function of Venue, by looking at Table 31 below, one notes that the pianist had very few oscillations with respect to partner and venues. The highest score was in Venue B (Secondary school) − as happened with cortisol testing − at moment B (during the recital) while playing with consolidated partner (V_1).

Table 31. Mean and SD of pianist's levels of heart rate playing with different partner, in function on Venue. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). A = before start the concert; B = during the concert; C = fifteen minutes after the end of concert.

Venue	Heart rate Overall					
	PV_1			PV_2		
	A	B	B	A	A	C
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
VA	96±0.707	102±5.303	97±3.536	94±13.435	99±17.678	98±28.284
VB	100±7.778	120±0.707	99±22.627	105±13.435	107±16.440	100±16.263

So, with respect to Venue, the pianist had different reactions from psychological and physiological responses. If, on the one hand, the anxiety was higher in Venue A (University), the physiological stress of the pianist was evident in Venue B (cortisol and heart rate).

7.5.3. Pianist playing with V_1 and V_2- Overall Repertoire

The last parameter to analyze is the Repertoire. The next Table 32 displays the reactions of the pianist performing with V_1 and V_2 in the two different repertoires. It is important to remember that for V_2 (occasional partner) there were no distinctions between recently and well-known repertoire. Again, the results confirm that the pianist is more anxious when playing with the consolidated partner. About the difference in repertoire, the pianist is slightly more anxious in WKnR "before" recitals, and in RKnR "after" recitals.

Table 32. Mean and SD of STAI Y1 (before and after) of pianist playing with V_1 and V_2 in function of Repertoire. WKnR= Well-known Repertoire; RKnR = Rectly known Repertoire. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner).

Repertoire	STAI Y 1 Overall			
	PV_1		PV_2	
	Before	After	Before	After
	Mean±SD	Mean±SD	Mean±SD	Mean±SD
WKnR	39.5±0.71	34.5±0.71	35±0.00	34±1.41
RKnR	38.5±3.54	38.5±2.12	35.5±2.12	32.5±3.54

Continuing in the analyses, there are presented the mean cortisol values and SD of the pianist playing with V_1 and V_2 with respect to the repertoire in the following Table 33.

Table 33. Mean and SD of pianist's levels of salivary cortisol (µg/dL) inferred playing with different partner, in function of Repertoire. WKnR= Well-known Repertoire; RKnR = Recently known Repertoire. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner).

Repertoire	Cortisol Overall					
	PV_1			PV_2		
	"A"	"B"	"C"	"A"	"B"	"C"
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
WKnR	0.146±0.057	0.228±0.197	0.162±0.028	0.208±.0120	0.173±0.052	0.140±0.040
RKnR	0.168±0.013	0.130±0.008	0.110±0.054	0.110±0.023	0.078±0.003	0.052±0.001

Observing Table 33 above, one notes that the pianist had higher levels of cortisol concentrations playing the WKnR. The higher values were found in "A" (before entering on

the stage) with V_2 and in "B" (that corresponds to the time during the concert) with V_1. Once again, results show that in the moment of performance ("B") the higher values of the pianist are always with the consolidated partner. The higher values of the pianist are always before the concerts with occasional partner.

With respect to the last physiological marker (heart rate), the following Table 34 presents the results in function of Repertoire.

Table 34. Mean and SD of pianist's levels of heart rate playing with different partner, in function on Repertoire. PV_1 = pianist performing with V_1 (consolidated partner); PV_2= pianist performing with V_2, (occasional partner). A = before start the concert; B = during the concert; C = fifteen minutes after the end of concert.

Repertoire	Heart rate Overall					
	PV_1			PV_2		
	A	B	B	A	A	C
	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD	Mean/SD
WKnR	101±6.364	109±15.026	107±11.314	109±7.78	115±5.480	115±4.950
RKnR	95±0.707	113±10.430	89±7.778	90±7.778	91±6.718	83±7.071

In function of Repertoire the mean values of the pianist's heart rate are very similar and very close to one another, considering that a difference of 5-10 bpm is irrelevant to the heart rate. Anyway, in general, there occurred an increase in moment B, with both violinists.

So, concerning the other possible affecting factor − the repertoire − the difference does not seem to be relevant. The WKnR represents the most stressful element for the pianist in heart rate and cortisol measurements during the performance. In other moments, as "A" or A, the higher value are found in RKnR. About the psychological aspect (STAI Y1) the pianist shows higher levels in WKnR in the moment "before" the concert, and in RKnR "after" the concert.

7.6. Which Musician Created the Stress?

The overall percentage of the Pianist's Stress in Duo was calculated for the parameters of Venue and Repertoire. This was done in order to find out whether the pianist or the violinist created a situation of stress for the Duo.

The formulas used are:

- **$P/(P+V_1$= CDuo)*100**

and

- **$P/(P+V_2$= ODuo)*100**

Following figures 40 and 41 show percentage of pianist's stress within CDuo and ODuo.

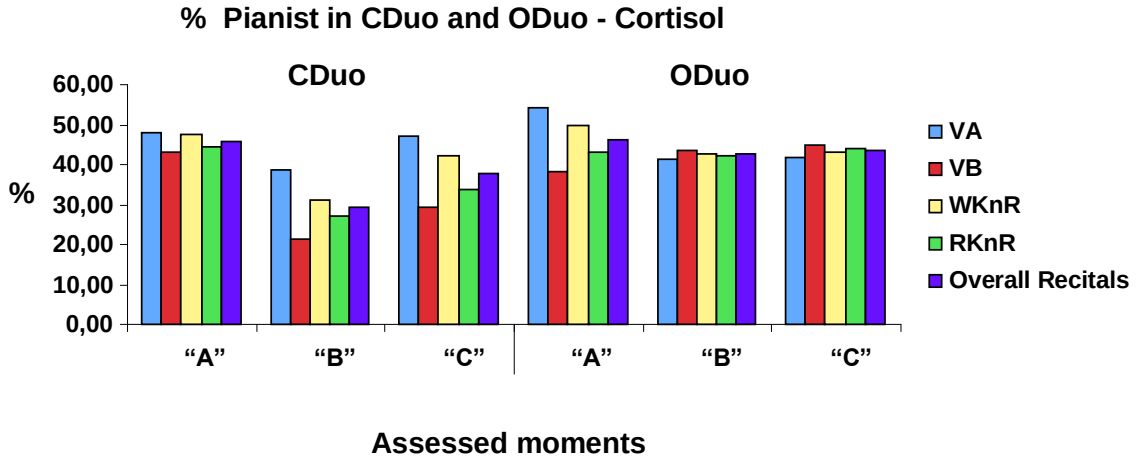

Figure 40. % Mean cortisol value of pianist in pianist in CDuo and ODuo duos. VA = University concert hall; VB = Secondary school; WKnR = Well-known Repertoire; RKnR = Recently known Repertoire.

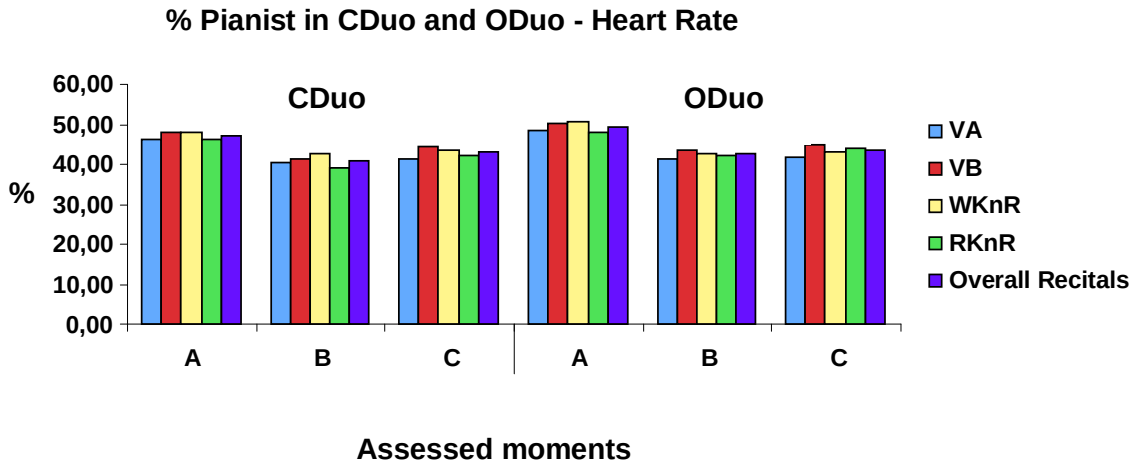

Figure 41. % Mean heart rate value of pianist in CDuo and ODuo duos. VA = University concert hall; VB = Secondary school; WKnR = Well-known Repertoire; RKnR = Recently known Repertoire.

Following, Table 35 and Table 36 display the percentage of the pianist's stress playing in consolidated and occasional duo.

Table 35. % of Pianist's stress while playing in CDuo and ODuo – Cortisol.

Variable		Cortisol %P CDuo			Cortisol %P ODuo	
	"A"	"B"	"C"	"A"	"B"	"C"
VA	47,95	36,23	53,03	57,57	42,79	43,21
VB	46,98	24,22	32,79	43,21	29,91	34,40
WKnR	50,57	32,07	45,38	51,45	52,99	56,37
RKnR	44,27	27,25	31,45	40,64	52,45	67,15
Overall Recitals	47,95	29,76	39,40	48,02	42,82	47,31

As is possible to confirm, the percentage of the pianist's stress in the cortisol tests was the highest with the occasional violinist, in ODuo, in time "A", before the concerts with 57,57 %. As well, in WKnR, the pianist also had a reading of 51,45%. In time "B" the higher value was in WKnR and RKnR with the occasional partner and in time "C", after the concerts, the higher cortisol value was in RKnR and WKnR too.

Table 36. % of Pianist's stress while playing in CDuo and ODuo - Heart Rate.

Variable		Heart rate %P CDuo			Heart rate %P ODuo	
	A	B	C	A	B	C
VA	46,32	40,34	41,54	48,34	41,22	41,91
VB	48,00	41,44	44,25	50,12	43,73	45,03
WKnR	48,05	42,67	43,45	50,48	42,67	43,09
RKnR	46,23	39,07	42,30	47,92	42,27	43,91
Overall Recitals	47,18	40,91	42,90	49,25	42,49	43,47

With regard to heart rate, the pianist had 50.12% with the occasional violinist, in ODuo, in Venue B. Too, in WKnR, the pianist also had a reading of 50.48%. Negligible,

these are the two instances in which the percentage of stress in Duo was generated by the pianist.

However, these calculations confirm that, since V_1 (violinist of CDuo) is the most stressed person of the three musicians in the analysis and V_2 (violinist ODuo) the less stressed, the percentage of the pianist's stress will be higher in the ODuo. Therefore, these calculations have confirmed that the psycho-physiological differences of the violinists have an impact on the reactions of the pianist and, consequently, on the Duo.

7.7. Perceptual evaluations

A final question that this research aimed to answer, in order to understand the impacts of partner change in duo performance, was whether there were any effects of such change on the audience's preferences in terms of two important musical elements: synchronisation and dialogue. The results of the listening test suggest that such a preference exists. Binominal statistical tests were carried out for the responses given only by the evaluators that showed consistency of preference when assessing replicated stimuli (from a total of 30 expert listeners, only 3 showed poor consistency in their ratings Cohen's[29] Kappa < 0.4). This type of test was chosen because data was dichotomous and categorical and the null hypothesis is that two categories are likely to be equally chosen (Kinnear & Gray, 1994).

As shown in Figure 42, for synchronization, from the average of all stimuli for synchronization, shows that 23 musicians (consistent responses) preferred the consolidated duo as compared to the recently formed one ($p < 0.01$). For dialogue the difference between consolidated and occasional duo is also in favour to the consolidated duo but with a difference not so evident (10,5 and 8 respectively consistent responses). This means that the synchronization parameter is more sensitive in function of the

[29] Cohen's kappa coefficient is a statistical measure of inter-rater agreement for qualitative (categorical) items. It is generally thought to be a more robust measure than simple percent agreement calculation since κ takes into account the agreement occurring by chance.

"solidity" of the duo with respect to dialogue parameter, for which it is possible to achieve a good level, although lower, also in the context of the occasional duo.

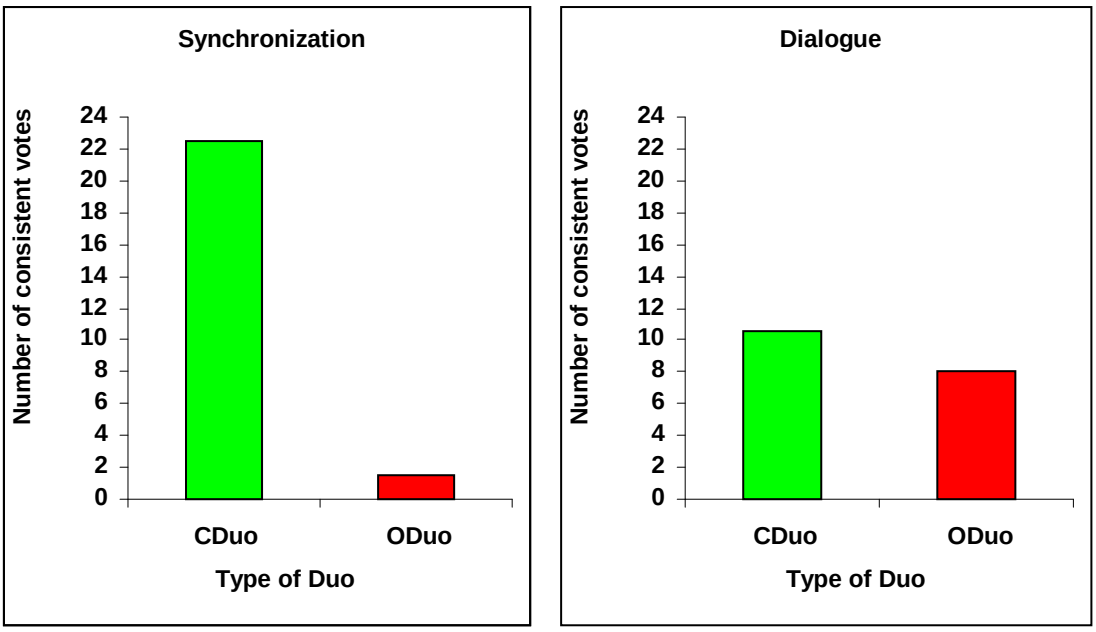

Figure 42. Preference for duos concerning synchronisation and dialogue between members of the duo, for both CDuo = consolidated duo and ODuo = occasional duo.

This seems to point into the direction of a hypothesis: the stress and anxiety related to higher expectations and the care for the other in the duo are important predictors of a preferable performance in terms of synchronization and musical dialogue.

The analyses presented above close this chapter about the tests results of the Action Research. The next chapter will give the Pianist's Perspective of the case study as reflected in her diary kept during rehearsals with both violinists. As well, interviews of the violinists of the case study will also be presented.

CHAPTER 8: REFLECTIONS OF THE OBSERVER/PARTICIPANT

8. REFLECTIONS OF THE OBSERVER/PARTICIPANT

8.1. The Diary

One reason for which it was decided to include the drafting of a diary by the pianist in the present study is due to the fact that the diary assists in reflection because life offers us new experiences every day from which we can learn to know ourselves better. In other words, "every day we write the logbook of our biographical journey" (Cristini & Cesa-Bianchi: 329).

Historically speaking, the practice of reading a diary on Sunday morning has its roots in the German Protestant habit of the 1700's. This gave rise to a meticulous narrative with the aim to dialogue with one's own conscience, which was one of spiritual foundations of Lutheranism. To this practice of keeping a diary are dedicated such people as Robert Schumann (1810-1856), who, along with his wife Clara (1819-1896) left us wonderful testimonies of life in their diaries written as "4 hands" (daily events, their wedding, etc.) and other prominent figures as J. K. Lavater (1741-1801), Jean Paul (1763-1825) – Mahler's (1860-1911) preferred writer – and even Goethe (1749-1832) (Restagno, 1998). After a stasis, the act of keeping a diary became a means of self-analysis during the second half of the twentieth century. Important literary references include *Intensive Journal* of Ira Progoff (1921-1998) and *The New Diary* (1978) by Tristine Rainer belong to this era, written as a journeys of self-discovery. For Progoff, the diary is the ring between the experience and its re-elaboration. For this reason, to keep a journal helps to exceed inhibitions and to make decisions in a more conscious and determined way. In a few words, it is a process of re-appropriation of itself (Pizzileo, 2011).

No less important is the function of the diary as a substitute for therapy. In fact, diary writing feeds self-expression and self-analysis because those who write up this kind of journal provide information about the events of their daily lives (Bolger, Davis, & Rafaeli, 2003). The recent research by Frattaroli (2006) about the usefulness of writing a diary showed very clearly that the results are positive and heterogeneous. Writing a diary helps to clear the mind from oppressive thoughts, to make sense, to learn how to better regulate emotions and to face the negative ones, and to improve relations with the social world and with themselves. More specifically, reduced anxiety produces a positive effect even in disturbing events (such as exams) and increases good mood by reducing somatic symptoms, stress, and feelings of worthlessness (Frattaroli, 2006). That is, writing a diary

becomes a way to vent and to externalize fears and thus in some way becomes a tool to get rid of. Lifting this burden would also benefit the overall health status of the subject.

In Psychology, the diary is used as a therapy, such as with adolescents or helping the parents of children with cancer (Duncan *et al*, 2007). In fact, to put words on paper allows one to give a more organic, precise and clear description to events and memories with related emotions and understanding. As a real re-elaboration process where the pieces are placed in order, understanding improves and strong emotions find a container in which to be vented. As a result, the person takes the necessary detachment to better observe the situation.

Several investigations show the beneficial and protective repercussion on physical and mental health. Pennebaker (1999), one of the most recent scholars on the power of the narrative (self-disclosure - self-disclosure or revelation of self), conducted numerous experiments and concluded that to externalize the experience linked to one or more stressful life events can help to process them consciously. It is well known that traumatic experiences, if not externalized and processed correctly, adversely affect the person on a general psychic level and in the hormonal and immune systems. Pennebaker (*ibid.*) has seen that writing in a narrative way, but not fragmented and disorganized, transforms memories, motivations, emotions, and feelings allowing one to deal with reality and to progressively change the way to relate with self, the others, and the world. In other words, it provides a sense of help.

Some experiments have also been conducted through a diary in the form of a questionnaire. These have included such topics as labour resources (autonomy, human environment, coaching) and others and are related with personal resources such as effectiveness, self esteem, and optimism showing that a positive relationship with others produces positive effects on the quality of the work done and the reasons for doing it (Xanthopoulou *et al*., 2009).

In the sociological sphere, the utilization of the diary - both as an instrument of collection data, and as a real object of study – was reluctant to assert as a consequence of the dispute of use quantitative or qualitative methodologies, which, for a long time animated the academic field (Micalizzi, 2009). The requirement to raise sociology to the rank of a science induced, over a long time, scholars to support a scientific approach aimed to assure measurableness, standardization, and therefore datum reliability.

On the contrary, according to the sociologist Cipriani (1995), lecturer at *Roma Tre* University, in the diary - as in all autobiographic material - it is possible to find inside the text salient and deep contents of high significance and with a higher import than the datum obtained from questionnaire and "pre-packaged" questions.

In general, an increase of interest towards qualitative approaches was determined from so-called “narrative turning-point”, a sociological viewpoint born in relatively recent years that attributes to the narrative a leading role within the history of man and society (Smorti, 1997). Through the narrative thoughts (Brumer, 1990), man gives meaning to events and realities. In this way, one tries to understand the most general sense of one’s own existence, to free one’s self from social masks behind which the true self is hidden while trying to hold together the pieces of the puzzle of our “being” (Di Fraia, 2004).

For all the reasons listed above, it was therefore decided to use the diary as a valuable tool in this case study in order to better understand the reactions of the pianist in front of two violinists. In this way, the diary becomes helpful to the understanding of the phenomenon itself.

8.1.1. Content and observations

The most notable aspects of the pianist’s diary are the desire for the ideal performance, the lack of concern for self, and the concern for other musician of the Duo. It is interesting to note that in the first series of concerts the perception of the pianist was much to the detriment of V_2 in the sense that the impact with the other violinist had seemed strange and superficial.

> *Playing with him was "strange": the way of articulating, note duration etc., it was very different... Despite knowing that he is a good professional his reading, for me, had a sense of superficiality... V_1 is a perfectionist and V_2 is very comfortable. So, in case of mistakes and imperfections these doesn’t bother him* [V_2]*. This makes a huge difference, though, between the expectations of one and the other, at least on my part.*

After the first rehearsal of the first series of concerts, performed with old repertoire, the pianist wrote in the diary:

> *Practically with V_2 we didn't talk about anything. Only we spent time to play from beginning to the end. When I asked about an ornament of Mozart, he merely proposed a way to realize it, saying: "but I can do as you want". What that surprised me: usually if I'm playing with someone and I want “to marry an idea of interpretation", I like that the other person explains*

to me why his choice and not to just say "I do so, but I can do as you want", like if this choice doesn't have any value.

Therefore, the P perception, after the second rehearsal, was a little different:

… But, on the other hand, V_2 aligns musically and when I asked him if he had anything to suggest he said that he thinks it's very easy to play with me, because it's all very clear and musical, and don't find any problem. He also said that with few pianists he could feel it.

I'm comfortable with him, I have the perception that he "hears" what I do and see that he is a good musician.

On the other hand, it seems to me that the depth of choices matured with V_1, it is impossible to recreate here.

It is... a sense quite different from the feeling that I love having in DUO, where the two complement each other and to participate because they chose, together, a path.

And in the last rehearsal before the first recital of all (1st series), P wrote:

... anyway, the fact of being in a good mood always helps. Communication is good and I think the recitals cannot go wrong.

So, after three rehearsals with V_2, P partially modifies her opinion about the experience that was being made with him (strengthening the idea that the opinion was changing with the process of knowing the partner) and, on the contrary, the day before starting the first series of recitals, P writes in her diary:

Today ... I feel pretty worried ... There are things about Duo that bother me. But interestingly, I worry that they can get away with the V_1, because I think I'm more relaxed with the V_2 because expectations are lower. With V_1, with which I play a long time, there should not be a problem, and perhaps, even there aren't! But the concern that everything can go better is raising expectations, such that I feel with a lot of anxiety! Even the cold hands ... wow ... that is long-time that it does not happen...

And, on the other hand, the day after, the day of first recital that was realized with V_2, P wrote about his feeling just "thinking to play" with another violinist, showing concern:

I'm a little worried ... And I already feel something "missing" by not playing with V_1 but with another person ... it is very different. I know the V_1 and his concerns, his rituals...

But I don't know V_2, and I cannot imagine how he "reacts" in concert. Of course he is a professional with big experience but...

In the day after, to observe the first experience with V_2 after some hours, P writes:

I'm a little tired. Yesterday's recital was decent. But the feeling onstage, with a violinist who was not V_1, wasn't very nice. It was very cold in the auditorium and my hands warmed only in 4th movement of Schumann... so, some passages of Mozart... The feeling was that the hands did not respond to my wishes! I feel ugly.

Overall, I was little emotionally involved...

While after the recital with V_1 writes:

> *In general, I was very quiet. Alias, I felt "at home" playing with V_1.*

And when a week later she played with V_1 the same program in a different venue (secondary school) P writes:

> *I was tenser than usual ... beyond the cold, was playing for the first time in this concert hall (where we recorded the 2nd CD) to publish in the school where I work only since this year, with colleagues and students to hear ... I felt the "weight".*

The day after, the day of the fourth concert, also in Venue B but with the V_2:

> *I thought ... he was pretty tense, worried for / with something... And the piece that was given us for these two concerts was not easy.*
>
> *By the way ... I enjoyed most the execution of this piece with V_1.*
>
> *But V2 knows being on stage and "sell" what he feels. And he's a good musician, very able to listen, react and there's always wanted to do something together even if we know us very few.*
>
> *I enjoyed playing with him.*
>
> *I think I was more relaxed than yesterday ... Also the concert hall was already prepared with everything and the second day is always less stressful because, simply, there are fewer things that I must do.*

The second series of concerts was realized five-months after, with the same protocol, i.e. three rehearsals followed by concerts. From the diary maybe one may consider interesting the general considerations wrote after all the concerts:

> *… All ran pretty well (the recitals). The strongest feeling I had was regarding communication. With the occasional partner, day 21 (VII Recital), went very well: although we were both very tired, we made a good and fun concert. With V_1, yesterday was also a very-very good concert, but my perception is always something that worries me. I worry about the fact that he is well and can play at will. Probably the fact of making only three rehearsal and recital (with violinist occasional) frees me a bit, in the sense that expectations are different and everything, that runs fine, plays a more important value…*
>
> *… In this second series of recitals, in general, I felt more confident with V_1, which made me feel better, almost as if my "feel good" depended on him.*
>
> *… In general, as I have said, with V_2 is always good: he is always willing and seems to be confident, also if he had not much time to prepare the concerts. V_1, on the contrary, if he doesn't feel many well-prepared, feels uncomfortable ... an excess of perfectionism and (unjustified) lack of confidence that led him to see everything in terms of worst.*

The sense of unpredictability, with the occasional violinist (V_2), puts the pianist in a more cautious state of "attention" because she doesn't know what can happen, what the other can do in musical terms. Thus, attention, or concentration, is necessarily very high. While, with V_1, it can happen that spontaneity and brightness are slightly "off" (or at least

this is the feeling of the pianist). Probably, this is because the pianist knows what will happen.

The pianist says, comparing the two experiences, that sometimes she has a feeling of lacking a bit of "fun" in the consolidated duo because things

> *are taken too "seriously" and they lose, at times, a certain freshness. It is obviously important to take seriously what we're doing! But I think there should be a little bit more tolerance on the unexpected (also mistakes) and enjoy more*.

An interesting aspect is about the fact to make decisions on music. The pianist feels that V_2 is very accommodating, maybe "too much".

> *In some rehearsal he told me "do as you wish, I will follow you". While it seems an act of great trust in me, in some moments I felt "alone" in making decisions. Which, on the contrary, it never happens with V_1 with whom, before deciding something, we always make a series of experiments that result in "OUR" decision.*

In fact, P recognizes that with V_2, the rehearsals were limited to executions from "beginning to the end" just to see if there were differences in terms of tempo and check if there were very strange things on the musical point the view. For the rest, it was all very soft. Musical ideas were similar and there was never much to discuss about some aspects, probably due to the fact of knowing that they had "only three rehearsals". So both musicians were, perhaps, more tolerant. In the consolidated duo, however, sometimes, the work of the details can become almost obsessive and it can become more complicated to let go. But P emphasizes to have seeing a change in the consolidated duo during the course of this experience. It seems that the partner V_1 in the course of the 8 recitals has had an evolution in the way he puts himself in front of the recital, at least according to the perception of the pianist.

In the diary, referring to the V_1, P wrote:

> *Now ... is leaving more space to "improvisation" of the moment. It's the time during which the body is reacting in a different way and needs physically different "supports" to express itself in a better way.*
>
> *What is curious is that I think V_1 has an unimaginable creative potential and that he still has not found it.*

For the pianist, to do well in chamber music, it is important to stop worrying about one's self and be more concerned about the whole. It is important "to take care" of the other and of the group, rather than ourselves. Training to do this is also important, as one reads in the diary:

… when you spend a lot of time alone, studying on your own and trying to be very much a perfectionist, I think we end up losing a lot of things along the way… It's clear that the goal is to clean up everything and to try to come closer to a performance as much as possible "impeccable". But this may not be the maximum target. The maximum target should be for me to make music together. It excites us and thrills others who are listening and enjoy and "take advantage" at most of us.

P says that unlike the first series of recitals, this time (during the second series), all three musicians talked more with each other about their own satisfaction. A reaction that P felt as strange, because the two violinists weren't present at the recital of the other.

We exchanged feelings and ... it was amazing to see how an experience can feed three positive reactions that help everyone to grow. That is the "positive" competition (probably unconscious) ... at least, it was what I feel.

Both V_1 and V_2 have asked me what I thought, what I think we played better and worse. Curious...

The pianist also recognizes her better ability to describe her insight in this second series of recitals, recognizing into the experience itself, regardless of the results, a very high value in terms of inner searching, recognizing in this way a pattern of growth.

P thinks and recognizes that few teachers don't care about the student as a person. Many professors take care of the students whom they mistakenly consider "their property" because they often use them to show how good they are to teach them to move his fingers on the instrument. They don't care at all of "inner world". So, often the students are transformed into "things" only in order to have a career and a better job, more prestigious or, more simply, the best paid. So the relationship with the other is not utilized and students do not learn to develop those characteristics of empathy and synergy that are so important to grow with each other. Perhaps a reflection about this topic would lead to review and re-think the figure of the teacher as a guide not only professional but also human, reflecting upon the fact that, according to the words of the professor of the author, a great Argentinian pianist Eduardo Vercelli (1935-1993), "to educate" comes from the Latin "*e-ducere*" which means "to lead out", to show the way, to bring to light something that is hidden within us, establishing an "exploratory" dialogue with the student and stimulating his creativity in order this teaches to think and not to learn passively.

8.2. Interviews with violinists participants

In this section, extracts of interviews with the two violinists of the case study are presented. These interviews focus on their attitude towards MPA, the way to face it, and the way to share it. The scheme of the interviews with the two violinists is exactly the same used for the interviews with the other six members of three consolidated duos. Therefore, the analyses here proposed refer to the following parameters: (i) the relation with stage and anxiety; (ii) sharing and suffering MPA with colleagues; (iii) their opinion about possible MPA causes; and (iv) eventual techniques to surmount MPA in case it occurs.

8.2.1. Interview with Violinist 2

The interview with the occasional partner (V_2) points out that he seems to be rather "relaxed" about any eventual mistakes and hence his attitude is a seemingly tranquil one.

> *I do not say to not be worried about it [the performance] but, at the same time, I know that I usually always have a little time to study and… if anything is not successful perfectly, I say to myself "o.k., never mind, there will be another opportunity".* (V_2)

Going on to state his perception and perspectives about MPA, he pronounces these exact words:

> *... all we who have this worry, I think, try to discover alternatives in order to go beyond this fear, anxiety.* (V_2)

In other words, the position of this violinist is that of someone who also suffers but strives not to show it by hiding it with an attitude that is almost an exaggerated opposite.

> *There are moments during which I am nervous as to others… if I am not really prepared obviously stress levels increase. But I always show an expressive countenance "ok, yeah" [he moves his hands towards heaven], a bit "as an actor". It is a sort of defensive position but sometimes, this defence, which is to attack and project a positive image, helps me.* (V_2)

So this attitude contributes towards a connection with relatively peaceful stage presence. In short, V_2 never suffered from problems that affected his health (such as vomiting before the performance), as happens in serious situations of MPA.

The violinist believes that the tremor of the bow is tied to breathing. But also the reason could be different.

Sometimes the bow quivers but this is a very normal thing for string instruments players. This can happen as a consequence of tiredness or lack of preparation. But I never had great problems. (V_2)

When the bow begins to tremble it is because the thorax is narrow and there is a big tension. (V_2)

Generally, from the whole interview it emerges that this attitude of V_2 – of the acceptance of his own emotions – was fundamentally due to the quiet support given by his father, who was not a trained professional violinist. His father gave a vision of performance as being a little bit "easy", unlike the professional musicians who are usually too worried about not playing wrong notes as if the deep meaning of music was just that.

When questioned regarding the influence of the teacher on his manner to face the "stage fright", the violinist uses the following words:

No, no. It was rather my father's example, who died young at the age of 51 years, and his influence was significant, his happiness in life. And it is something that concerns my personality. (V_2)

As regards to sharing MPA with others, V_2 affirmed that, neither in the professional context with colleagues nor in the familial context with his wife (a pianist with whom he sometimes also performs duo repertoire) he never talked about it. Nor did the others ever share this problem with him even if

… one notes that the people are nervous. (V_2)

V_2 considers also that many of our worries live only in the mind:

We play for a public that we think has some expectations. The fact is that if the public does has not them, we think that they do. (V_2)

Obviously, this creates in the performer an answer regarding anxiety that is about others' expectations. In other words, in the end, it is a worry that we could cause in those who listen to us.

V_2 considers also that the comparison with recordings (CD, DVD) provokes deep worry because

[a recording] *can be retouched, digitized again. This is a negative aspect because it is something not pure.* (V_2)

On the contrary, instead of anxiety in duo, V_2 says that when he plays in duo, his worry is turned particularly to fact that the partner (his wife, in this case) feels well and that her score, known perfectly by him, does not create problems for her. Therefore, his worry depends on the worry "for the other".

As far as the techniques used to contrast negative emotions that can arise from MPA, V_2 affirms that what helps him very much is to play the piano before the recital because this relaxes him. He says also to do stretching of muscles and tendons but that the most important aspect regards a healthy mental attitude.

To have positive thoughts, this helps me very much. (V_2)

In the opinion of the violinist, to play many times a programme for friends, family, teachers, and so, contributes a lot to go beyond mental disturbances that may happen before performance (and sometimes also during).

From this interview one deduces that the individual characteristics (emerged from the results of the test STAI Y1 and Y2) are hereby confirmed by self-perception of the violinist: he does not appear as a trait-anxious person. He has an attitude of professional responsibility but he is not overwhelmed from it. So, he perceives the time of performance as only "a moment", avoiding giving it a value that can lead individuals to live with exasperated anxiety. On the contrary, he closed the interview with a funny sentence:

There should be invented a machine to measure the pleasure that I had to play with you. (V_2)

8.2.2. Interview with Violinist 1

Contrary to the position of V_2, V_1, in his relation to anxiety, states dramatically:

... There have been many moments of terror ... Clearly, at the beginning, when I was younger, I suffered less ... even if it happened, sometimes, that if I was not focused enough or I had not studied in a certain way, worry, and then the fear grew. When I could study well, concentrate, fear passed me by....

I always thought that with time this anxiety would pass ... [moves his hands as if to say "not at all"!]

Instead, it is worse...

Before playing in duo, I played in a Trio and a String Quartet. We studied, played in a certain way that was serious…but some relationships were not so important. Maybe no one knew how to relate, perhaps because we were young. There was more the enthusiasm to do well, but without the worry. (V_1)

Trying to better understand the reasons for his worry about performance, V_1 asked himself from where it came, but without ever having had perhaps the strength to deal it seriously.

In the interview, he began to talk freely, recounting various episodes of his musical life (to which we do not refer here), but which show that in fact within the groups, with which he has done so much experience (largely in the string quartet), there was no space to address the problem of MPA. While, in the Trio, the only advice he had came from the pianist who had suggested he take a beta-blocker.

During the interview, trying to "spit it out", V_1 voiced that probably the family expectations on his success have had a great influence (on his MPA). Son and grandson of artists, V_1 has always felt the burden of having to not only meet his own ambitions but also those of others.

Many times he was subjected to an implicit imposition and taken for granted, such as the fact of "having" to play memory even in contexts in which it is not normally, e.g. competitions for orchestra. This always created in him a great emotional strain, which inevitably has impacted on his way of facing the moment of the performance, which was experienced as a moment of absolute and great importance, independent of venue or repertoire. For this, during the interview, in talking about his attitude with respect to MPA, V_1 says:

> *If I play at Carnegie Hall or in the village is the same for me... I'm worried*. (V_1)

In addition to individual features, surely even the social experience has affected the development of his MPA. Not least, perhaps, the fact that he had, close to him, examples of a difficult relationship with performance.

> *Clearly, however, I have had also an example at home ... of worry and fear. My father* [a professional pianist] *has performed many concerts and he was always very anxious....* (V_1)

So, V_1 complains that either within groups of chamber music to which he has devoted himself for years, neither the family nor the teachers whom met on his way (despite being famous names in the international music scene) have been of help to solve his catastrophic perception of the performance, affirming that he “never had any help from any teacher” with MPA. In fact, he tells an amusing story in which one of his quartet teachers, a great musician with a world career, before performing quintets by

Mendelssohn (the teacher will take part as the other violist) in stating the need for "alcohol", which he required to clean the violin keyboard, held out a bottle of brandy that he carried in the inside pocket of his jacket, telling him " take my dear, drink that; it makes you good". Clearly, his teacher was trying to cope with the situation in this way. It follows that different solutions could not come from him.

On the other hand, V_1 acknowledges that he is an introvert, closed, and that, probably, he perhaps has never managed to ask for concrete help to someone. That is, he kept these fears within himself because the most important information that he received in his youth was that he had to find the solutions by himself, without the help of others. Moreover, and on the rare occasions in which the violinist tried to speak about this subject, the answers were rarely of sharing and understanding: "if you have anxiety, you should count on it, period". However, he also says that his rare and timid attempts have not been of benefit (using beta-blockers, alcohol, etc...) because, for fear of those same substances, he was taking little ridiculous doses so that they could not have results.

One interesting aspect that emerged from this interview is the awareness of V_1, of which, in some moments of his life when situations have required a strong position (because of an important exam, a competition for the European youth orchestra that exclusively requires a duo performance, and others), he is able to find adequate strength and the correct attitude to become pleased with the results but that also helped him in his personal struggle with MPA. That is, in the occasional moments in which he imposed his musical personality on others by assuming the role of leader, he always played very well and was more relaxed. He recounts various episodes (we mention here only one that refers to a quartet contest, which they won):

> *… finally... I do not know what has happened to me but I remember that I played very well. I say "I played", in the singular, because at that time I did not give a damn about others. I thought, "you must follow me and that is enough!" They have followed me well and the quartet has gone well.* (V_1).

In an attempt to explain the reason of his reactions, during the interview V_1 also says something very interesting:

> *just today ... I thought: at the end, in my opinion that much of my early musical life I have always tried to do what others told me I had to do (even when I was the Concertmaster shoulder in the orchestra)...and perhaps, as a matter of character, so as not to displease others a little, I always did what others said.* (V_1)

V_1 believes that he has not done enough to grow away from the point of character and that his attitude of acquiescence is an illusion that it would help him to grow, but ultimately prevented him from exploring those internal resources that are so important.

> *However, in this way, maybe I am submissive, that I put aside my musical personality, perhaps. I do not know, I maybe grew up a little... (makes a gesture with serpentine hands) ... because, my musical safety has always been a bit challenged. So maybe everything the others said to me was more important than what I thought about it myself.* (V_1)

In this arduous search for explanations, the violinist gives, almost to himself, the reason for his submissive attitude, saying:

> *Perhaps because they always said to me that we must respect everyone* (V_1)

So, it seems that the violinist did not manage to get rid of beliefs that led him, even by his fundamentally indolent and submissive nature, to adapt to others while being able to grow within himself, thereby experiencing feelings of dissatisfaction and even anger up to the point when

> *… the repressed part of my bad* [he smiles], *a little 'bad* [moves his hands] *comes out and eventually takes over!* (V_1)

Indeed, it appears that the respondent, who lives a very active life as a professional performer at a high artistic level, has become aware, in recent years, has the biggest problem to overcome with regards to his own thoughts and expectations (his and others).

The violinist declares that he is concerned with helping those young people who are suffering because most will go forward in time to more demanding situations which will be to confront others and to be compared to recordings, which very often can be detrimental:

> … *understanding…the ... emotional quality ... of sound.* (V_1)

To conclude, in order to deal with MPA V_1 claims to be in need of a great mental preparation before playing (about an hour) in order to can play a bit "more easily" and to find the right balance. To use his own words, he needs time to find

> *... the person* [he mentions his name] *who is not afraid and who does not dread the public*. (V_1).

8.3. Conclusions

From the diary's content and the interviews with the violinists an important aspect emerges: the psychological profile of each member is confirmed both from results of

psychological − and also physiological − tests and from their self-perception. This demonstrates the veracity of the responses of respondents and, at the same time, the fact that these tests can actually help in the reading of the aspects linked to MPA. Thus, future applications in the training of professional musicians through application of these tests could be a help in understanding the phenomenon and maybe in solving the problem.

CHAPTER 9: THE PIANIST'S PERSPECTIVE: DISCUSSION AND GENERAL CONCLUSIONS

9. THE PIANIST'S PERSPECTIVE: DISCUSSION AND GENERAL CONCLUSIONS

9.1. Introduction

This study has aimed to understand the reactions in psycho- and physiological responses of the pianist, regarding Music Performance Anxiety by placing the pianist in two different contexts: by playing the same repertoire with two different partners in two different venues. Also, it has intended to redefine the observer's perspective, in order to create a new epistemological field, based on the emotional interaction of two musicians who work in a Violin-Piano Duo setting.

To date, all the literature in the music domain shows great interest about non-verbal communication in chamber music or interest about the capacity to study a new piece in rehearsal. Also, a large part of the research is related to MPA in all of its forms and situations and in different contexts other than chamber music. However, so far, no study has been directed to understand how the individual reacts to MPA within in the chamber music duo. Thus, the specificity of this study is to have approached the central theme of MPA in a chamber music context, more exactly in instrumental chamber music duo, would be of interest to the scientific community.

For the purposes of studying MPA in the partner change process, this study can be considered as exploratory and conclusive, because it has developed a series of possibilities that can be thoroughly explored and explained. So, after the experimental demonstration of the presence of anxiety in Duo formations, the dynamics of the relationship responsible for it have been taken in account. In this connection, the pianist's personal reports registered in her diary, a sort of "gestaltic" self-narration and self-assessment of her performances, and have revealed themselves to be very functional.

What was repeated several times during the first and second part of this thesis has been a work that has been centered mainly on the analyses of the reactions of the same pianist in two different contexts. In these different contexts, the pianist performed two series of repertoires that were similar to each other in their technical-musical aspects but different in terms of prior knowledge of them (since one new "sight-reading" work was given for each recital especially to measure MPA). These two series of repertoires/recitals

were performed by the pianist with two different violinists, one of whom is a stable partner in the duo for fourteen years.

Another point of reflection was the impact of MPA on the duo performance. For this reason, all tests applied in the study had the objective to understand the psychological and physiological responses principally for the pianist. However, these tests were administered, with two exceptions being the Kenny MPAI test and the listening perception tests, to all subjects. Then, the study considered three central factors: venue, repertoire, and partner in testing.

9.2. Discussion of results

9.2.1. Effects of changing venue, repertoire and partners in performance in anxiety and stress levels of the pianist

Looking at all the results obtained with psychological and physiological tests, the analysis of diary, the interviews, and the perceptual listening test, the author will attempt to interpret the data and describe what happened.

As the reader will remember, the central question of this investigation concerns the extent to which changes of partner in performance affect anxiety and stress levels in performance when other possible factors that may affect the performance (such as repertoire and performance venue) remain the same. With regard to the self-concept test, the pianist shows overall general good self-esteem. She is not an anxious person, as the MMPI-2, K-MPAI and STAI Y2 tests revealed both in performance and in the social life. All her variations occurred when assessing the three factors: venue, repertoire, and partner.

Looking at Venue, it is clear that for the pianist Venue A (University) represented the more stressful environment in both psychological and physiological ways, despite heart rate differences not being considerable. The possible explanation is that the University environment is tied to the concept that it is a more intellectual context where, probably, it is possible to find a more critical response.

With regard to Repertoire, it can be said that in the psychological sphere, for the pianist, there was no difference between WKnR and RKnR, although in the physiological realm the higher values were found always in WKnR. A possible explanation is found in the pianist having higher expectations for a specific consolidated repertoire. This concept is reinforced when one observes the comparison between WKnR and NRp: the higher reaction in the pianist was always in the old repertoire, played many times more than Never Rehearsed pieces.

The results are now discussed regarding Partner Change. It is important to remember that the psychological tests show that the pianist does not have an anxious personality profile. In fact, from the detailed results presented in chapter 7 of this work, it is evident that the bigger difference in terms of stress and MPA in the pianist was constantly tied to the influence of partner element. Therefore, the first important observation to present is that the human component − the relationship with the other − represent the most stressful factor for the pianist as compared to the repertoire and the venue.

The most interesting and perhaps most surprising result of this investigation − considering the evidence from these psycho-physiological tests of STAI, cortisol, and heart rate − is about “which” partner (consolidated or new) caused the most stress in the pianist. The more stressful partner for the pianist was the long-time violinist of the consolidated duo. This finding was impressive, for the self-perception of the pianist (through the diary) corresponds to results of psychological tests, more than other physiological tests. That is, the pianist always showed higher values in psychological tests, especially in STAI Y1 in particular, even when cortisol or heart rate deviate from this profile.

Sporadically and exceptionally, some cortisol's values of the pianist was slightly higher with V_2, it is true. However, it never occurred in the "B", moment, i.e. "during" the concert. A possible explanation could be the unknown reactions of the new partner, because it happened only "before" the concerts.

Concerning heart rate tests, the difference between playing with one or other violinist was absolutely irrelevant to the pianist, despite, after analyzing the eight recitals with the overlap of video and heart rate were found moments in which, playing exactly the same part of piece, the different reactions with the two violinists were very high. Just to

give an example, in the beginning of the second movement of Gedicke's Sonata (RKnR), the heart rate of the pianist was about of 80 bpm with the new partner while, with V_1 - the consolidated partner -, was approximately 100 bpm. This difference, despite what could be considered not so relevant because the variation in heart rate depends on many variables, shows that the reaction of the pianist was clearly higher in the consolidated duo.

So, in the light of what has already been said and to attempt to respond to the first of the research questions that were first raised in chapter 1 of this thesis - *Are stress and MPA markers of playing with different partners in performance?* – one can affirm that the aspect of changing partners in duo performance proved to be the vehicle to show the increase in the pianist's MPA, which was always higher with the consolidated partner. Concerning stress (measured with cortisol and heart rate), there have been little differences despite the higher values being found in the pianist always with V_1 during the recitals. Interestingly in terms of cortisol, one notes a constant decrease from the beginning to the end while playing with V_2 and an increase with the consolidated partner, corresponding to the reaction of the V_1.

It is also important to note that, however, the results obtained in this study are almost always not statistically significant. In order to be statistically significant, a larger number of participants and tests would have had to be realized. Consequently, all the considerations are purely illustrative and indicative of a specific case study.

Looking at the results of all the tests and generally finding a higher level of MPA and physiological stress in the pianist when performing with the consolidated duo violinist, several possible answers were taken into consideration when trying to understand the reason for this reaction. In the field of social and emotional ties, many studies in social psychology considered the fundamental notion of empathy as the emotional response that leads to interact with others, on the basis of emotional involvement with them.

The ability to share the emotions of others is carried out with a cognitive process that leads us to recognize emotions in others through a mechanism of discrimination of the detected expressions in their faces or in gestures. Within this perspective, it appears appropriate to speak of a true "theory of mind" in fact defined as the ability of explanation and psychological understanding possessed by humans, which allows them intuitively to understand the emotions, actions and mental states of others through simple mental inferences (Perner, 1999).

The processes of empathic identification using the mutual representation of the experience of others, however, seems to characterize some of the more sophisticated forms of emotional sharing, present especially in the emotional dimension of adulthood, where empathy is inevitably accompanied by higher cognitive processes (memory, attention, knowledge, thought) (Hoffman, 1984).

This process will unavoidably be more pronounced in a relationship in which the communication and the relationship are built during years rather than a few days, in the case of an occasional collaboration with another musician. If a person is deeply connected to someone and both cultivated certain qualities of empathy, typical of an affective relationship, it follows that the well-being of the other well-being becomes one's own well-being, and *vice-versa*.

So, being that the highest values are found in the WKnR playing with the consolidated partner, the reaction of P shows, that there is no concern with self but rather "with" and "for" the other. This ability to achieve synergy and empathy, which is highly developed in the consolidated instrumental duo, is highly prized. However, it can also turn into something negative at the level of the perception of self and in terms of stress.

The most plausible explanation of the case study results is found in the fact of the consolidated duo having a deep emotional bond with each other, which seems to be a prerequisite for empathy and creates a strong synergy. These elements, in addition to bringing positive aspects to the duo, also transform themselves into negative aspects when one member of the consolidated duo, for reasons of a personal nature, finds himself/herself in a situation of psychological difficulties of anxiety, which then, in turn, produce physiological stress. Therefore, it is clear that stress and MPA are markers of playing with different partners in performance.

From reading the pianist's diary, it is observed that the worry for "the other" increases the pianist's own worry about the "common" result. The author wants to be worthy and deserving of their work and to have "the other" feel satisfied and fulfilled. It is recognized that personal control and self-oriented perfectionism can have repercussion on performance anxiety among professional performers (Mor *et al*. 1995). Thus, it is possible that the pianist is affected by the anxiety of the other performer and is not able to detach − thus revealing a strong empathy with the "other" − to feel the same discomfort of the "other", and to reflect, without meaning to their collective levels of anxiety.

This result manifests the pianist's active emotional mirror neurons. Confirmations of one type of learning phenomena are supported by the existence of mirror neurons and the ability to mirror what is observed if there is a strong motive for doing so (Arbib, 2002; Gallese, 2003, Rizzolatti & Sinigaglia, 2006). The traditions of music learning and performance, such as Master/Apprentice, specific "schools" of interpretation, the Suzuki method and others that employ strong reliance on imitation are all possible because of the phenomenon of mirror neurons (Harper, 2007). As well, there is ample evidence that the capacity to recognize emotions, such as empathy with another, is mirrored through the nervous system and through experience (Chapin *et al*., 2010; Freedberg & Gallese, 2007; Singer, 2006; Rizzolatti *et al*., 2001).

In music performance done by groups, the complex biological mechanism underlying the social behaviour of humans, whether of a motor, or emotional or musical nature, may be the result of the interaction of mirror neurons of the members of the group. In unpublished correspondence with the author, researcher Leonardo Fogassi[30] explains mirror neurons in a group context:

> *… Starting with the motor aspects: to play together you need to achieve a match that starts with the recognition and immediate understanding of the movements of the other. This understanding (which, I repeat, is not based on a reflection, but on an automatic motor resonance) results in a subsequent reaction.*
>
> *A second element is based on the identification of the emotional state of the other. For years, studies have shown that the automatic empathic understanding of others' states of mind is based on a mirroring mechanism, similar to what you have for actions. In this case, probably a factor such as anxiety could be conveyed by variations in the kinematic motion of the other. Of course, other factors (family history, expectations, etc.) can modulate the empathic response.*
>
> *Finally, it is also possible that the musical aspect has an effect of mirroring, as it has been seen that some aspects of music, probably related to the movement which produced them,*

[30] Leonardo Fogassi is an Italian neuroscientist. He is professor of neurophysiology at the University of Parma (Italy). He is a member of the group of scientists who, in 1992, discovered the existence of mirror neurons.

activates the same brain areas that are activated during the observation of actions. (Fogassi -Facchini, 2012).

Thus, it is possible that the reaction of the pianist is due to her empathic emotion that she shares with the consolidated partner and, because of possessing strong mirror neurons. However, future tests would have to be conducted in order to confirm these findings.

9.2.2. Opinion of the other consolidated duos on MPA and stress in performance

In order to answer the second research question − *What are the opinions and views of other consolidated duos on MPA and stress management during performance?* − the six interviews realized "to catch" the opinion and point of views of other consolidated duos on MPA and stress management, give another interesting value of this study. From these interviews, two main topics about MPA emerged: suffering and sharing. There emerged that in each duo one member was clearly more anxious than other and that the other felt clearly the discomfort of partner. The interesting and relevant aspect, in the opinion of the author, is to observe the difference in the attitude between the older duo and the other younger two duos. It seems evident that the new generations are more interested in understand and to solve chamber music group dynamics and to try to share and to solve the problem of MPA within the group. Of course, being a "consolidated" duo, they have played together for many years and the level of knowledge of the other is very deep. In other words, the chamber music duos interviewed are composed of husband and wife, or two siblings. So, they are people who have a lot in common, besides music: they have life in common, living in very close proximity to each other. However, despite their intimate relationship, the oldest duo said that they never had shared the appearance of MPA, the theme of which they had not discussed because it was "normal" to have anxiety and it was the price to pay to stay on the stage. So, what is changed is the large interest of psychologists and sociologists about certain arguments and the attitude of some musicians who are wondering how and what it can do to overcome this problem and to help others to solve it. Yet, it is still a long way to go in this direction. In fact, all interviewed admitted that is very hard to speak about the theme of MPA in the context of colleagues because, in a certain way, people are not prepared to discuss and to confront themselves with this theme. Generally musicians think that in order to safeguard their own professional image it is out of place to talk about these issues. So, even today in a

professional environment, despite the interest of many, the taboo has not been overcome. Musicians rarely confront this issue and if they do, they do it with certain serenity. And the music teachers themselves, as seen by the interviews conducted in this study, do not help in this process because many of them did not overcome this problem themselves.

Regarding the themes of sharing and empathy, the interviews confirm that the strength of a consolidated duo is precisely due to the fact that the members know well each other, although this can mean a certain amount of suffering when one notices that partner does not feel at ease. However, this observation will not prevent professionals, who do not have any special bond of affection, to make music at a high level, as the tests of our case study also show.

Just as the author mentioned about the difference between good instrumentalists and musicians, so here one could make a difference between good professional performance (intending with this, choice of style, tone, dialogue, synchronization) and a performance that is able to go beyond and can evoke "poetry". This distinction was made by five of the interviewees who has dedicated the entire professional musical life to their duo (see chapter 5 of this work, Andrea D_1, Giovanni e Mario D_2, Isabella e Rodolfo D_3).

9.2.3. Effects of MPA and stress levels on quality of performance

As regards to the third important question of this research − *Do MPA and stress levels, as a consequence of changing partner in performance, affect the overall quality of duo performance?* − the listening test, presented in chapter 8, shows that the preference of experts' listeners was for the consolidated duo. Their perceptions were based on aspects of synchronization and dialogue between the duo members. Happily, this is not a surprise that the consolidated duo was preferred. It signifies that a serious work, developed during many years, is recognized by the expert audience. It is a comfortable result that "repays" as a result of a lot of effort and dedication in seeking the quality and the expressive skills to be able to put themselves "at the service of music". This means that the high expectations deduced from the first research question do not always have negative repercussions on the quality of performance. On the contrary, high expectations

can provoke higher MPA, but can be useful to achieve satisfactory results in performance – becoming almost “a necessary evil”.

9.2.4. Underlying causes of changes in psychological and physiological markers

About the other (final) research question - *What underlying causes (personality, self-concept, tasks, expectations, or feelings) could account for changes, in both psychological and physiological markers, during music performance for a pianist when playing within a consolidated or a just newly formed instrumental duo contexts?* - the present investigation also confirms that the causes that could have determined the pianist’s reaction, in psychological and physiological aspects, depend on personality, self-concept (one saw that the low self-concept is correlated with anxiety), tasks (repertoires in this case), cognitive mirror neurons and also expectations. Especially the aspect of self-concept is tied with fears of negative evaluation, defensiveness, and other forms of anxiety (Hembree, 1988).

Huron explains that “the emotions accompanying expectations are intended to reinforce accurate prediction, promote appropriate event-readiness, and increase the likelihood of future positive outcomes,” and that “music-making taps into these primordial functions [of emotion] to produce a wealth of compelling emotional experiences” (Huron, 2006: 4 cited in Croom, 2011).

In fact, looking at the reactions of the three musicians, this study can confirm that a poor self-concept creates a higher level of anxiety and stress in performance. As the reader will recall, from the personality profiles emergent from various psychological tests (MMPI-2, STAI Y1 and ICAC), the most anxious element, the V_1, is a musician who suffers the most in performance.

In the case of the pianist, who has a profile of a little anxious person, the most important aspect remains the predominant influence of “the other’s anxiety”. This is verified when playing with a new partner of whom she does “not have to worry" and when the reactions of the pianist were always less anxious and stressed.

So, everything said until now makes it possible to develop the concept of synergy and empathy of which it was mentioned before. These concepts can be referred to a condition of contemporaneity not only synchronic (people do the same thing in the same time, or people make two different things in the same time), but as well diachronic (people do the same thing during a period of time we establish, more or less). Effectively, the operation of music has not anything to do with the synchronic overlapping of two or more behaviours, two styles, two personalities (Armezzani, 1995). On the contrary, the operation to make music is researching diversities, and is not afraid of them, because it is recognizing the role of completion and integration. This is not only a technically sound consideration, but it also takes into consideration a wider methodological concept. It refers to the main actors of sound, or music, performance: the "people".

9.3. Implications in chamber music and higher education

As emerged from the interviews with the two violinists of this case study, besides their trait personality, their family environment has also played a certain role in relation to the expectations of themselves, and thus their approach with music performance. It emerged, also, that the educational context, didn't help to solve the problem of MPA. Unhappily, in the latter, frequently the methodological approach is directed just to form an instrumentalist to be able to play. But, as all good musicians know, to play an instrument is not only a "physical exercise".

It is a little bit difficult, therefore, that a methodological approach, like the above mentioned one, could increase the fundamental quality of synergy and empathy between performers, or teachers and their pupils. (Russo-Facchini, 2012, unpublished correspondence).

The best examples of synergy, from the processes of biological life, to chemical-physical ones, imply not only parameters of contemporaneity, but rather of sequence and succession. In the descriptive and applied human sciences, these parameters enlarge the coordination and much more the complementarity and the reciprocity of the elements. However, we can understand that like the specific categories of "synergy" and "empathy", a great conceptual dignity regarding the same living organisms and their complex systems may be attained. We can say every process that happens in nature

contains this function implicitly. In other words, it is enough to think about our thoughts, about how much coordination is necessary for execution of movement, for rhythm of breathing, for heart beat, for secretion of hormones or neuro-mediators, in responding to internal or external environment of the person's necessities (Russo -Facchini, 2012, unpublished correspondence).

Thus, one of the first emerging considerations is that synergy and empathy are not a "luxury", but rather qualities which improve performances. That is to say that the single individual who possesses and trains this function immediately determines the effect to stimulate, in the context, a sort of forced change: an acceleration in physical terms, a yeast in biological terms, that is going (and goes) to introduce a transformative contextual process, a sort of reshaping of collective positions and dynamics (Merleau-Ponty, 2003).

So, the roles of the single members of the system − their mental processes thoughts, emotions, behaviours, expectations − in the same context will be all modified. Therefore, we will find a more humanized and functional context, able to increase efficacy, even excellence of performance, and wellness in term of individual experience (Russo-Facchini, 2012, unpublished correspondence).

For this, it will be desirable that in the educational context professors would be more attentive in this direction.

9.4. Positive aspects and limitations of this study

Despite its limitations, the multi-disciplinary case study has the advantage to not give a general or specific look about a phenomenon. As a consequence, through deep analysis, this case study had the possibility to understand as much as possible about the phenomenon in a specific context: the consolidated and newly formed instrumental duo's MPA, as well as that of the constant subject in both duos − the pianist.

One of the positive aspects was the employment of methods and procedures from other scientific areas, in order to measure and observe phenomena in the instrumental duo setting. Psychological testing revealed and confirmed important information about the subjects, which was already intuitively perceived by the pianist of both duos. Insights were

gleaned from the physiological testing of cortisol and heart rate monitoring. Further confirmations came from listeners' perceptual tests regarding duo preference in aspects of synchronization and dialogue. In all of these tests applied to the instrumental duo, none had been done before in any country. Thus, this case study is a pioneer study in many aspects.

By necessity, this case study was restricted to only three active participants. As such, this research has been obviously possible only thanks to the collaboration of the three participants of the study and their willingness to get involved and, at times, to appear even in seeming vulnerability or fragility. Without their valuable support, this work would not exist. For the author, this represents the most precious aspect of the study that seeks not necessarily to produce generalizations, but to raise even more questions. Obviously the interest for the author is to improve the quality of performance and also to understand the mechanism of MPA in order to ameliorate the well-being and the quality of the group life and, in doing so, to learn to create the best condition, so as to enjoy all the creative process in making music.

9.5. Final reflection and conclusion

As was mentioned earlier, the reaction of the pianist shows that there is no concern with self but rather "with" and "for" the other. This is clear from reading the diary in which it manifests the worry for "the other". One of the more important results of this study was not expected. It has been demonstrated that to inhabit a sure space, able to be protected from all threatening events, does not create stability. So, in the consolidated duo, the presence of a known partner produces major levels of anxiety in the pianist, more than with an unknown one (Russo-Facchini, 2012, unpublished correspondence).

According to popular and generic opinions, new events could be problematic, threatening, and even destabilizing. In consequence of this prejudice, people could produce reactions to avoid every unknown event, perceived as unpredictable and uncontrollable in their consequences. Thus, after the first macroscopic result was obtained, the aim of the present study became not to consider a research of the musician's personal causes of anxiety, but to show all the possible circumstantial causes that generated anxiety in this specific situation.

As regards the circumstantial levels, we have to consider the partner's evocative role: all the functioning mental patterns become almost automatic; he represents and attracts. It's as if the strengthened habit to stay, work, and produce could strongly prevent or delimit the duo together in new experimental possibilities, for the opinion is that any new space to be explored would have already been done. Consequently, the consolidated duo allots itself another implicit task: not to explore new ways, but "to do well". But, to do well is, normally, more stressful than to explore: so, the duo lives in a crisis and, in its attempt to adapt, produces anxious mechanisms. About the implicit task that the consolidated duo allots itself, "to do well", one observes, in the first phase, a progressive rising of anxiety, with a positive meaning: to activate resources in reply to an unfavourable situation, a sort of charge for increasing internal possibilities (Russo-Facchini, 2012, unpublished correspondence).

As one knows, anxiety does not contain only annoying or immobilizing uneasiness, but it can contain an enormous transformative power, a message for permanent change. If the person doesn't understand all that, he/she will suffer from the negative effects of anxiety to the detriment of wellness and performance efficacy. In the latter case, one loses the deeper positive meaning of anxiety − a message that can produce positive changes and does have not the effects of threatening wellbeing and performance efficacy.

Going on with the explanations of the onset of MPA, one has to consider how the presence of someone who one perceives it, such as a family member or close friend, could induce a situation in which he/she becomes particularly exacting with himself/herself for fear of disappointing people who are reliable for them and are a solid landmark. In that case, the tension of wanting to do well for the best possible is itself clearly correlated with anxiety. Besides, the presence of someone who protects us can be perceived like a blocking or binding force, in other words, a tie that becomes a chain against which the person "revolts". The intolerance of this perceived oppression contains the characteristics of anxiety (Russo-Facchini, 2012, unpublished correspondence). So, the different reactions of the pianist performing with two different partners could be explained in this way. That is, as emerged from her MMPI-2 test, the pianist − being a person who considers exploration as a personal rule − views and lives new situations as a privileged space of introspection, research, and expression. In this manner, the newly formed duo represents a less stressful situation compared to the consolidated duo for the pianist. An artist knows, in a more or less conscious way, that to inhabit new spaces leads to

attainments, awareness, and discoveries, in order to build and improve one's own personality.

To penetrate in an unknown territory, one produces a lot of modifications in one's own internal world. That lets the person to be able to contact their unexpected personal sources. Obviously, the same sources could not be reached if that person lived in the certainty of expected routes and results. Various internal dynamics, generically, can determine all that: the curiosity to imagine what a person will find in front of a new situation, or the challenge to cross one's own usual limits, or the push to run away an oppressive or repetitive reality without appreciable perspectives. When the person has crossed the boundaries of his/her usual limits, and has felt fear or become estranged, he/she is obliged to find ulterior internal sources, if he/she doesn't want them to remain latent or under utilized. So, for a musician, the incursion into a new internal and external space and the production of differentiated dynamics and of emotional *nuances* is necessarily directed to creating very precious emotional material, to convert it into appreciated artistic production.

Particularly, in this context, music becomes a metaphor of humans living together, a sort of peace-maker of group organizations. If in the common group organizations, like for instance whatever working team, the action of everybody in conformity to a certain time scanning reveals itself as very functional and makes the performance excellent, in a chamber music group, to start together, to keep time, to enter in that exact time, reveals itself as the fundamental aim. The working group can do without such a strict respect of a time choice, but the chamber music group cannot allow itself not to respect the right choice of time. Each contribution to the performance must happen in the right time and only in it. That is the miracle of making music together.

Obviously, another possibility to explain the different reactions of the pianist, playing with two different partners, is that the individual characteristics (personality, self-concept, individual anxiety levels, and perfectionism) influence "the other" in a performing context where the interaction and the integrations are considered essential qualities to achieve performance optimization. So, this study reinforces the fact that the qualities and characteristics of "the other" can influence the partner's reactions. One knows, for many years, that the emphatic comprehension of the other's moods is based on a mirroring, similar to the one for actions. This explains why the central subject of the study, the

pianist, presented different reactions that were not so much evident in the repertoire or the venues of the performances but more especially with a different partner.

Consequently, it is clear that emotional and intellective investments are real forces able to give rise to events which can be materially created by relationships, feedbacks, pooling reciprocity, and comparison. In this regard, synergy and empathy lead to express their own power (meaning potentiality, not dominion) for learning to not suffer from situations, but to live them without pre-packaged answers.

This methodological approach could be and would be a further step for studying the comprehensive context, not only a single phenomenon, in order to produce valid feed-backs to the different actors of the process, making more strong (in them) their sense of belonging to the context. So, their possibility to generate and to share an energetic and emphatic field will head for a general and appreciated improving in the comprehensive quality of life.

9.6. Future directions

The amazing chamber music world represents, for the author, the best “territory” in which musicians can grow up in both human and professional capacity, cultivating the ability to communicate, to share, to integrate, to interact, to cooperate, and to feel together. All these qualities are extremely important not only in professional fields but also and maybe much more in the human aspect.

Only if we realize that, more than ever, there is now the necessity to train us in this sense, one can think to grow as individuals and as society. I.e., to learn to cultivate synergy and empathy we can lead us to the appreciation of the inter-personal capacity of communication between members: something that a chamber music group needs. It will determine the results of the group’s functioning and consequent achievement of their objectives during the performance. In other words, through effective inter-personal communication, the members of the group will define their own roles and eventually solidify into some kind of group identity and to produce satisfying results for all members. So, the synergetic and empathic indicators within the group will help to avoid the common

existent struggle for leadership, as for example, to convert this tendency towards the collaboration and share, transforming the "instrumentalists" into "musicians".

In a few words, a perspective would be desirable to encourage, at all levels of education, the study and practice of chamber music in general and in duo specifically, promoting the development of skills, introspective and behavioural processes that may have a positive impact not only on a professional level - in terms of improving the performance - but also at the social level. In fact, it is evident that the "duo field" could be fertile ground in which to work on the MPA (if both people are available to share) because the "duo" represents an environment in which it might be easier to express (being only two persons), on this subject, their view in the intimate context. This study hopes to represent an "open door" for the future investigations and challenges in order to better understand how the MPA of one member of the group can affect the other and, eventually, how it is possible to solve the problem.

As a pianist who practices within the chamber music area for approximately thirty years (playing continuously in the instrumental duo, with the same violinist, from about fourteen years) and having experienced several circumstances in which "individual anxiety" has became crucial and problematic for other members of the group, the author thought that is important to be able to work on the special personal inner world, to understand and to solve it. Therefore, a future direction to solve the MPA both in individuals and, consequently in chamber music, in the plane of studies could be introduced formative courses to explore themselves through particular techniques such as, just for example, the Alexander Technique – a valid instrument to reduce muscular tensions accumulated during whatever performance and thereby take control of one's self. Or, also, a course of yoga (Khalsa, S. *et al.,* 2009) whose practice implies a way towards the perfect knowledge of our selves is a valuable mind-body tool. Anyway, something that helps every person to know her/his body's reactions should be able to assist in controlling MPA.

For the future, in order to understand exactly the already described research results about the musicians of the duo, it could be important to obtain deeper diagnostic tests of the same musician(s), especially regarding their personality's structure and their relational functioning. In this regard, one can consider very opportune, within a clinical examination, to administer other psycho-diagnostic tests like TAT (Thematic Apperception Test), Personal Constructs Assessment, and the EPQ (Eysenck Personality Questionnaire).

As both the violinists affirm in their interviews, there was not a good reference given in their educational lives in order to cope with anxiety. So, if a person - like one of the violinists in this study - has a personal trait of anxiety, he will be "sentenced" to suffer at the moment of performance, regardless of the fact of being an excellent musician. For that, could be interesting to apply, for example, the MMPI-2 in the educative context in order to understand and to help students with individual characteristics of "anxious type". So for the future it could be desirable that all music professors had a sensitive approach and alliance with the MPA theme in order not only to improve their own performance but, also, to be a valid and helpful reference for the students.

Also, if in the future one could deepen a study like this, it would be ideal to try to involve in such an experience a greater number of Duos. However, the author thinks that it would still be extremely more difficult to implement it due to the costs incurred for biological research, the availability of duos to study a new repertoire, to play many concerts in different contexts, to find other "occasional" violinists, pianists willing to write and reveal a diary, and so on.

The more emergent problem, in the opinion of the author, is that people do not really know how to communicate and share. Many people have not been trained and accustomed to this practice which is of vital importance for the society. After all, the phenomenon of MPA is nothing more than a poorly managed reaction of emotions that is important to recognize, encode, and tackle. But, until some time ago, teachers rarely took care of this aspect in the formation of the student. The result is that, even today, there are professors who advise their students to take medicines or drugs to solve their problems related to MPA (!).

Generally, to develop the capacity to discuss in constructive form is a quality which rarely is the object of worry for music teachers. Unfortunately, and frequently, professors assume the authoritarian attitude showing, at first, their own incapacity to collaborate and to share. Consequently, it is not a surprise their incapacity to appreciate and recognize the importance of chamber music practice, in the human and professional "route", as a privileged channel of growing up. In fact, only through effective inter-personal communication, the members of the group will define their own roles and eventually solidify into some kind of group identity and to produce gratifying results for all members. It is exactly for this reason that, for the author, exists a colossal difference between an "instrumentalist" and a "musician". More and more, everyday one sees a lot of

many good instrumentalists, like "war machines" to win competitions, in which it is impossible to make mistakes and play wrong notes. But it could be very important, for the author, that the instrumentalist recuperates the most important aspect of making music: to share with others and to express. Yet, in order to express themselves and to share, it is necessary to have something to share and to express. So, the work that one should do is not so much on those "motor" aspects - so important to reach necessary mechanical levels - but on that world of emotions, sensations, for which knowledge is constantly cultivated with care.

Not surprisingly, chamber music was born (as it was possible to see in the historical overview about chamber music and duo, in chapter 1 of this work) in a high cultural context where the musicians do not just play an instrument but discussed and confronted other forms of culture and art such as philosophy, literature, poetry. Perhaps, professors should stop a little and think about it and about the quality of human life in our times, despite all the technological development and technical instrumental progress.

One special particular aim of this study has been represented while emphasizing the role of internal world of individuals within chamber music (the instrumental duo, specifically), of everything that moves inside them (Cadamuro, 2004). Really, in the cultural musical view we have not greatly considered the individual as a carrier of this special world – that of teaching. Often, teachers haven't emphasized the emotional world of the pupils, but rather their abilities, for example in touching the instruments with their fingers.

It seems evident the quality, the importance and the space that should be given to the practice of chamber music, so that making music can play one of its most important roles, of sharing, which, as we have seen in the contextualization of this thesis, was the beginning generator of the academies many centuries ago. For that, a deep reflection by professors would be necessary, wondering if the path they are following is for the pupil's training or the pupil's guide to self-discovery. Perhaps it would be important to review all teaching of music in a different light not just that of the unstoppable competition but as the opportunity to transform ourselves into something better than what we are.

But, perhaps, if there was a "revolution" in teaching, if teachers ask themselves what is really the function of music in the education process − cognitive, and social − for students, whether teachers were less competitive with each other, more collaborative,

also available to the sharing of those aspects that are more "awkward " in performance as the MPA, less envious of the success of their own colleagues, this “revolutionary” attitude would become contagious and wonderful living examples to imitate. And one might hope that the contagion, through mirror neurons, could positively spread like wildfire. Perhaps it could be very important to redefine the idea about "success": not necessarily success as a synonym of social respect, money and luxury. For the author, a man or a woman of "success" are her parents with their wonderful example of life, or her professor, almost unknown (1st prize Munich competition), who loved for all his students and who "lived " in them because of possessing an example of high professional quality, integrity, generosity, humanity... Success is not also necessarily a synonym of “notoriety”. Many times the real successes are those that take place in a small environment in which there is the miracle of sharing and from which there can be born only wonderful things, so as it has been for chamber music.

And maybe the music teachers, who have the privilege to work with "material" that has enormous power in the emotional world, should be more concerned to transmit these values and learn how to put themselves "at the service" of the music.

Finally, chamber music, if practiced with a good guide – for example, a professor able to show not only the musical content but above all the enormous power and beauty to live and share something together – can have the power to change people in a better way and contribute to the human world’s future by giving and showing the importance of “respect for the other”.

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APPENDICES

Appendix 1. Consent form for interviews

Universidade de Aveiro Campus Universitário de Santiago/ 3810-193 Aveiro Portugal
Telefone (+351) 234 370 200 - Fax (+351) 234 370 985

RESEARCH PROJECT: Musical Performance Anxiety, Stress and Communication in the instrumental Duo.

Main goal: this study tries to verify if the individual "Performance Anxiety" element exists in an Instrumental Duo relationship range, which impact has on the performance and in what ways.

This study also aims for verifying if the Duo components are aware of this reality and, if positive, to know which were or are the adopted strategies to solve the problem.

The participants' role.

The collaboration, only with an interview, of people that were (or are) part of an Instrumental Duo for so many consecutive years, playing in important concert halls, will be fundamental to obtain a broader vision from this phenomena, including the personal/emotional implication that can be established inside an instrumental group such as the Duo.

In this research project, the interview is only a part of a much larger one which will include, for Fiammetta and her instrumental Duo, tests on personality, as well as psychological tests (before and after the concert), cortisol in the saliva measuring (at the performance day) and heartbeat frequency measuring during all the concerts.

The researcher role**.**

Fiammetta Facchini, undersigned, is committed to:

1. Guarantee full privacy on the collected and acquired data and information

2. Guarantee that the data provided by the interviewee will only be used for research purposes

3. Guarantee that the interview will not cause prejudice the interviewee's performance by any means.

INFORMED CONSENT

I undersigned ……. declare to be aware of the research project "Musical Performance Anxiety, Stress and Communication in the instrumental Duo" and its searching procedures, as well as my role in this study as a participant (in this case, only the participation on the interview).

Name of the interviewee……

Signature……

Fiammetta Facchini - Rua 26, n° 427 – 3° Esq./ 4500-163 Espinho - Portugal

Tel. +351.964793858

E-mail: fiammettafacchini@hotmail.com

Web-site: www.duotrammafacchini.it

Appendix 2. Text of semi-structured interviews

In the first place it will be necessary to ask a few biographical questions, so that we can identify the origin and the kind of experience in the specific area (chamber music duo):

Therefore:

- Name

- Nationality

- Years of Duo experience

- How did the group start and where did the most activity happen, and if there is any personal/intimate relationship between its components.

The **first group** of questions must aim at giving a general outline of the DUO's profile.

- How many concerts per year do you perform?
- Do you have any recordings? In the case of an affirmative answer, of what kind?
- What kind of repertoire did you choose? Was it a free choice or has it been suggested by the concert philharmonic societies? Did any composer write a piece for you?

The **second group** of questions has the purpose of knowing if the people involved in the Duo had (or have) problems related with stage fear and if they have ever talked about it.

Also if, during their careers, have they been able to identify any situations that normally caused (or cause) them stress.

- Have you ever had problems related with stage fear?
- If positive, do you usually speak about it one with another, recognizing your own difficulties managing the situation OR did each one try to solve the problem by its own, intimately?
- Have you ever felt hard to recognize yourself and the others the discomfort of trying to manage the stage emotions?

- Could you tell us /speak about any particularly difficult experience?

The **third group** of questions is about the need of knowing if, inside the group, in the case this “theme” has been spoken about, was it faced and in what terms /which way.

- In the case you both spoke about this problem, how did you face it? Was there a passive acceptation of the problem (you can call it “phenomena”?) or did you try to solve the problem in an active way?
- If “yes”, how did you do it?
- Did you use any special technique?

The **fourth group** includes questions on the effects of the used problem solving techniques which they experienced.

- When did you start to speak about this problem and started to use the techniques to solve it?
- How long did its application technique take?/ Did it took a quite considerable time?
- Was there any results and, if positive, how much time after?
- If you did not use any kind of technique, did the single fact of talking about it and showing the other member how much discomfort did you feel, had any impact?
- If the case of an affirmative answer, was the impact positive or negative?
- The “other”, facing the fact that you have admitted, how did he react?
- Did he/it contributed specifically to help you solving the problem? Or not?
- After all, was it useful to talk about it? Was it useful to strengthen your communication, or did it create any kind of discomfort towards the “other”, facing, suddenly, a whole new situation?
- Finally, could you resume how your “journey” as a Duo has been along the years?

Appendix 3. Consent form for violinist participants

Declaration of Consent of Biological Samples

In the context of scientific project study of music performance and biological and psychological variables, leaded by University of Aveiro researchers Luís Souto de Miranda, (Department of Biology), Anabela Pereira (Department of Education) and Nancy Harper (Deparment of Arts and Comunication), I _____ undersigned, declare to authorize the collection of saliva samples for scientific purposes only, including storage, laboratory and data processing and presentation and/or publication of scientific results and that I've been informed of the objectives of the research and that all data will be treated anonymously and with confidentiality.

Date:_____

Signature:_____

Appendix 4. List of music score web sites

- **Mozart Sonata in C K.303**

http://petrucci.mus.auth.gr/imglnks/usimg/9/9e/IMSLP63027-PMLP03429-Mozart_Werke_Breitkopf_Serie_18_KV303_Piano.pdf

- **Mozart Sonata in B K.378**

http://erato.uvt.nl/files/imglnks/usimg/a/af/IMSLP63061-PMLP03436-Mozart_Werke_Breitkopf_Serie_18_KV378_Piano.pdf

- **R. Schumann Sonata in D-min. op. 121 n. 2**

http://javanese.imslp.info/files/imglnks/usimg/6/67/IMSLP281302-PMLP17324-RSchumann_Violin_Sonata_No.2__Op.121.pdf

- **A.Gedicke Sonata op.10**

http://conquest.imslp.info/files/imglnks/usimg/8/8e/IMSLP61149-SIBLEY1802.10167.35f7-39087004871267score.pdf

- **L. Eller- A. Wilhelmj "Valse Diabolique"**

http://conquest.imslp.info/files/imglnks/usimg/c/c1/IMSLP62205-PMLP127054-Eller_Valse_diabolique_Piano.pdf

- **J.Field "Melancolie"**

http://erato.uvt.nl/files/imglnks/usimg/0/01/IMSLP44325-PMLP95275-Field_-_Melancolie_Violin_Piano.pdf

- **Wilhelmj "All'Ungherese"**

http://erato.uvt.nl/files/imglnks/usimg/6/69/IMSLP61209-PMLP125215-Wilhelmj_All_Ungherese_Piano.pdf

- **E. "German Bolero"**

http://petrucci.mus.auth.gr/imglnks/usimg/0/04/IMSLP161123-PMLP289868-German_Bolero_Score.pdf

Appendix 5. Material and methods of measurement of salivary cortisol

(Document kindly given by Maria João Soares)

For the levels of salivary cortisol samples collected the Protocol Hight sensivity Salivary Cortisol Enzyme Immunoassay kit by Salimetrics® was used (Salimetrics, 2010). This kit is based on the so-called ELISA enzymatic test, i.e. based on laboratory techniques that use antibodies or enzymes which couple the antibodies or antigens (Salimetrics, 2010). Thus, it is used for the test, a micro plate coated with monoclonal antibodies of cortisol. The cortisol present in the samples and standards used compete with cortisol tied to peroxidase from binding sites from the antibody of the plate.

After incubation, the unbound or loose components are washed and the bound peroxidase cortisol can then be measured by the reaction of the enzyme peroxidase with the substrate tetramethylbenzidine (TMB). This reaction will produce a blue colour which then will lead to a yellow after stopping the reaction with sulfuric acid. The optical density is read at 450 nm. The amount of cortisol peroxidase detected by measuring the colour intensity is then inversely proportional to the amount of cortisol present (Salimetrics, 2010).

The list of equipment required for carrying out this protocol (Salimetrics, 2010) was the material provided with the kit Salimetrics ® should be stored in refrigerator at a temperature of 2-8 ° C and stored at room temperature prior to use:

- Microtitre plate with 96 wells coated with antibody cortisol
- Standards with known concentrations of cortisol (3.0, 1.0, 0.333, 0.111, 0.037, 0.012 ug / dL)
- Controls High and Low of Cortisol run in each analysis to ensure the quality of the results.
- Wash Buffer Concentrate - Wash Buffer
- Assay Diluent
- Cortisol Enzyme Conjugate
- TMB Substrate Solution into
- Stop Solution
- Wells for Microplate without antibody to cortisol (NSB - Non-Specific Binding wells).

Material that was required but was not provided with the kit was:

- Micropipettes with a capacity of 15, 25, 50 and 200 and their tips

• Multichannel Micropipette with capacity of 300 ¶ l and their tips

• Vortex

• Shaker Plates

• Plate Reader with 450 nm filter

• Deionized Water

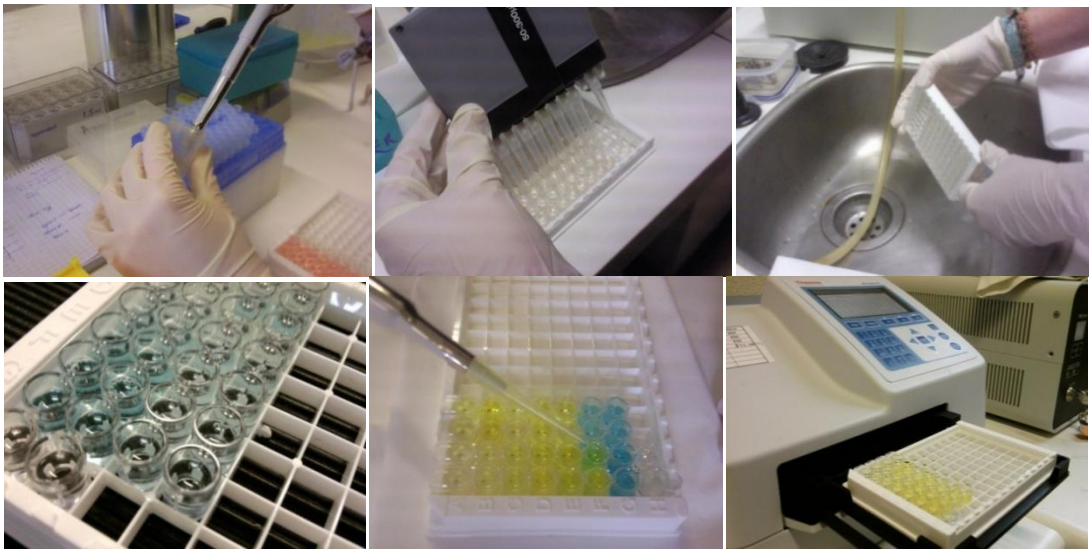
• Disposable tube with a capacity of 24 µl

• Pipette with capacity of 25 µl

The following are the sequential steps of the experimental procedure that must be performed (Salimetrics, 2010):

1. Bring all reagents to room temperature;
2. Determine the layout of the card. This must be prepared in manner corresponding to the defined layout, with the NSB properly placed on the plate. The unused material should be kept again in the refrigerator.
3. Pipette 24 µl of Assay Diluent into a disposable tube, previously placed room temperature.
4. Pipette 25 µl of standard, controls and samples into the appropriate wells. For each NSB and each well, which will serve as zero, should be pipetted pipetting up 25 µl of Assay Diluent. To ensure the quality of the test results, pipetting of samples and reagents must be done as quickly as possible (without interruption) across the board. Ideally, the process should be completed within 20 minutes or less.
5. Make a dilution 1:1600 of Cortisol Enzyme Conjugate, adding 15 µl of Conjugate to 24 ml of Assay Diluent. Mix immediately the solution of Conjugate diluted and pipetted 200 µl for each well.
6. Shake on plate shaker for 5 minutes at 500 rpm and incubated at room temperature for a further 55 minutes.
7. Wash the plate 4 times with 1X Wash Buffer after being properly diluted with deionized water. Cleaning can be done by pipetting 300 µl of Wash Buffer diluted for each well, and then discarding the liquid by inverting the plate over a sink. After each wash, the plate must be completely dry on paper towels
8. Add 200 µl of TMB solution to each well.

9. Shake on plate shaker for 5 minutes at 500 rpm and incubated in the dark at room temperature for another 25 minutes.
10. Add 50 µl of Stop Solution to each well.
11. Shake the plate for 3 minutes on the shaker at 500 rpm.
12. Clean the bottom of the plate with a damp cloth, that do not release wires and dry.
13. Read the plate in a reader at 450 nm. Read the plate within 10 minutes after addition of stop solution.
14. Calculate the mean optical density (OD) for all duplicate wells.
15. Subtract the average of wells NSB from the average of zero, standards, controls and samples.
16. Calculate the Percent Bound (B / Bo) for each standard, control and sample by dividing the average (B) by the average for the zero (Bo).
17. Through the use of suiTable software, to determine the concentrations of the samples and controls by interpolation curve parameters that best models the variation of the B / Bo as a function of the logarithms of known concentrations and cortisol standards.
18. Cortisol samples with values greater than 3,0 µg/dL (82.77 nmol/L) should be diluted with Assay Diluent and runs again to obtain accurate results. To obtain the final concentration of Cortisol multiplying the concentration of the diluted sample by the dilution factor.



Photos of Maria Soares and Filipa Tavares about the steps of the protocol. The first image is the addition of Assay Diluent to the samples; in the second and third images washing the plate; the fourth image may observe the blue color obtained by the addition of TMB to the samples; at the fifth is evident color changing the samples after addition of stop solution and finally we have to read the card.

Besides the simplicity and ease of application, this not-invasive Salimetrics ® protocol was also chosen by the high correlation obtained between salivary cortisol and plasma ($r(47) = 0.91$, $p < 0.0001$). It also has a high sensitivity (0.003 mg / dl) and presents high values of recovery and precision (Salimetrics, 2010).

To reduce and minimize the experimental error caused by inaccuracy, all samples were analyzed together with standards. Wherever possible samples were also analyzed in duplicate to minimize potential errors and enhance the results.

The software chosen to handle the data was GraphPad Prism 5[31], itself for treatment biostatistician, modelling and obtaining graphs of biological data (GraphPad Prism 2011). With the support of this software, the statistical analysis used to buy data was essentially ANOVA and Bonferroni post-test.

REFERENCES

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[31] GraphPad Prism is a powerful combination of biostatistics, curve fitting (nonlinear regression) and scientific graphing in one comprehensive program.

Appendix 6. Description of process of overlap of video and heart rate

Procedure for the collection of the videos with/using ECG and HR

1. Importing the vídeos from the DVD using the software program **"ConverterLite".**
2. Convertion of the imported DVD to AVI using **"Converter Lite".**
3. Creating a project in the "SigVsync" with video AVI and ECG, captured with the Vital Jacket.
4. Synchronizing the video with the ECG according with the provided data by Fiammetta.
5. Capture of the ECG already synchronized with the video, with the program **"Corel Video Studio Pro X5"**.
6. Capture of the Heart Rate using the program **"Corel Video Studio Pro X5".**
7. Creating a Corel project with the video AVI + capture of the ECG + capture of the HR.
    3.2. Organizing the video according to the diagram supplied by Fiammetta.
    3.3. Signing the extracts to edit in the video.
    3.4. Exporting the video in mp4 in High Resolution.
8. Os vídeos podem ser lidos com WMP ou um leitor de vídeo equivalente. Videos can be played using the WMP or a similar video player.
9. Importação dos vídeos em DVD com aplicação **"ConverterLite".**
10. Conversão dos DVD´s importados para AVI com **"ConverterLite".**
11. Criação de um projecto no **"SigVsync"** com vídeo AVI e ECG captado com o VitalJacket.

Appendix 7. Reports of heart rate measurement by cardiologist (medical reviewer) and technical analyst

Exam Start: 2012-01-18 18:21:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 138 bpm at 19:18:47 and the low heart rate was 82 bpm at 18:29:55. The mean heart rate was 110 bpm.
The caloric expenditure during the recital was 370 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-18 18:21:00

Name: **Violinist 2**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 160 bpm at 18:40:50 and the low heart rate was 76 bpm at 18:22:01. The mean heart rate was 135 bpm.
The caloric expenditure during the recital was 835 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-19 18:18:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 130 bpm at 18:54:42 and the low heart rate was 78 bpm at 19:23:02. The mean heart rate was 98 bpm.
The caloric expenditure during the recital was 289 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-19 18:18:00

Name: **Violinist 1**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 157 bpm at 19:19:46 and the low heart rate was 73 bpm at 18:26:14. The mean heart rate was 133 bpm.
The caloric expenditure during the recital was 783 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-26 18:19:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 150 bpm at 18:42:36 and the low heart rate was 81 bpm at 18:30:56. The mean heart rate was 117 bpm.
The caloric expenditure during the recital was 423 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-26 18:19:00

Name: **Violinist 1**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 162 bpm at 19:08:59 and the low heart rate was 77 bpm at 18:31:27. The mean heart rate was 139 bpm.
The caloric expenditure during the recital was 848 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-01-27 18:20:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 140 bpm at 19:13:07 and the low heart rate was 83 bpm at 19:49:14. The mean heart rate was 117 bpm.
The caloric expenditure during the recital was 421 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

 1 - 6

Exam Start: 2012-01-27 18:20:00

Name: **Violinist 2**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 163 bpm at 19:20:22 and the low heart rate was 77 bpm at 18:37:37. The mean heart rate was 135 bpm.
The caloric expenditure during the recital was 827 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-14 18:16:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 135 bpm at 19:31:28 and the low heart rate was 74 bpm at 18:22:32. The mean heart rate was 103 bpm.
The caloric expenditure during the recital was 350 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-14 18:15:46

Name: **Violinist 1**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 161 bpm at 18:55:48 and the low heart rate was 74 bpm at 18:16:25. The mean heart rate was 136 bpm.
The caloric expenditure during the recital was 866 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

 1 - 6

Exam Start: 2012-06-15 18:18:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 110 bpm at 18:36:58 and the low heart rate was 67 bpm at 18:20:16. The mean heart rate was 84 bpm.
The caloric expenditure during the recital was 213 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-15 18:18:00

Name: **Violinist 2**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 152 bpm at 19:17:46 and the low heart rate was 77 bpm at 18:27:53. The mean heart rate was 124 bpm.
The caloric expenditure during the recital was 741 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-21 18:20:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 129 bpm at 19:30:47 and the low heart rate was 71 bpm at 19:37:59. The mean heart rate was 94 bpm.
The caloric expenditure during the recital was 280 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-21 18:20:00

Name: **Violinist 2**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 146 bpm at 19:13:12 and the low heart rate was 76 bpm at 18:23:50. The mean heart rate was 118 bpm.
The caloric expenditure during the recital was 698 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

Exam Start: 2012-06-22 18:18:00

Name: **Pianist**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 130 bpm at 19:10:00 and the low heart rate was 73 bpm at 19:49:42. The mean heart rate was 92 bpm.
The caloric expenditure during the recital was 281 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)

 1 - 6

Exam Start: 2012-06-22 18:18:00

Name: **Violinist 1**

Conclusion

Sinus rhythm.
During the monitored period, the high heart rate was 164 bpm at 19:15:49 and the low heart rate was 75 bpm at 18:23:22. The mean heart rate was 136 bpm.
The caloric expenditure during the recital was 909 kcal.

Technical analyst

(Dr.ª Carina Leite)

Medical reviewer

(Dr. João Sá)